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APRIL
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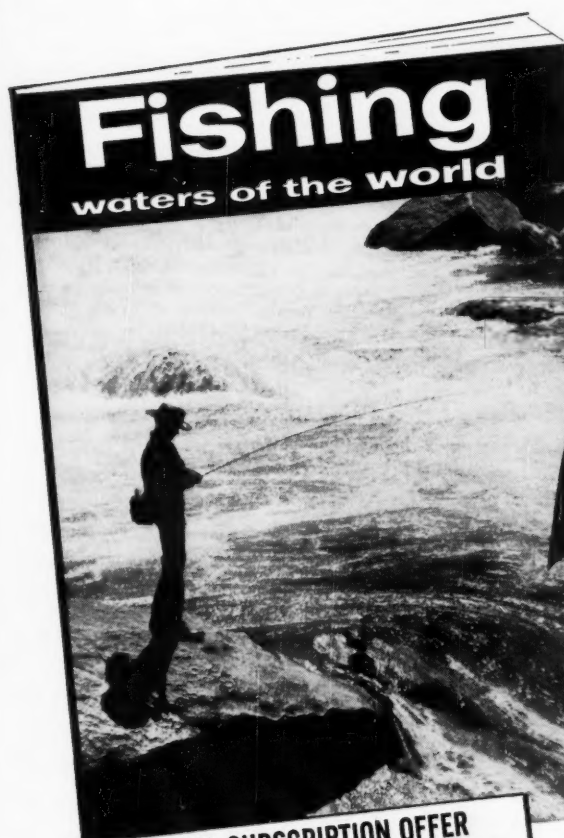
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The Barren Ground Caribou of Keewatin

By Francis Harper. Lawrence, Kansas. 1955. University of Kansas. 163 pages. Available from the Arctic Institute of North America, 1530 P St., N.W., Washington 5, D.C. \$1.50.

"No other large North American land mammal is of such primary importance as the Barren Ground Caribou as a source of food and clothing for so many primitive Eskimo and Indian tribes; no other performs such extensive and spectacular migrations; no other may be seen in such vast herds; no other exhibits so close an approach to a Garden-of-Eden trustfulness in the presence of man. And perhaps no other is more worthy of being cherished and safeguarded in its natural haunts for the benefit and enjoyment of future generations."

This is the opening paragraph in Dr. Harper's introduction to this report on the status, history and habits of *Rangifer arcticus arcticus*. This eminent naturalist has been able to carry to its completion an exhaustive study of this caribou through a grant from the National Science Foundation. The result is an important contribution to mammal literature by one of the leading mammalogists of the United States.

As the Indians Left It

By Robert Sparks Walker. Chattanooga, Tennessee. 1955. Hudson Printing and Lithographing Co. 239 pages. Illustrated. \$3.50.

This is the story of the Elise Chapin Wildlife Sanctuary and of the Chattanooga Audubon Society. Until 1838 the land that is now the sanctuary was owned by the Cherokees, who then were forced to move to Oklahoma. From 1872 until it became a sanctuary, it was the Walker farm. Indeed, it was during that time actually a refuge and managed so that it was as fertile as when the Indians left it. The author was born and reared on the farm, and he has divided his interesting book into two parts. The first deals with the farm and the methods employed upon it and life in the "horse and buggy days." The second part describes the conversion of the area into a wildlife sanctuary, and has special and practical value to anyone interested in establishing such a reserve. Together with it is presented the story of the growth of the Chattanooga Audubon Society.

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By HOWARD ZAHNISER

Mr. DeVoto's Easy Chair

IN HARPER'S
MAGAZINE FOR
November, 1955,
Bernard DeVoto

made his 241st contribution to "The Easy Chair"—a monthly department that he had been writing for that magazine for twenty years, thus continuing from his predecessors "the oldest editorial feature in American journalism." This initial article, in what he took to be another beginning decade, Mr. DeVoto used as a testimony of his purposes and his intentions in writing "The Easy Chair," a testimony that was also an attempt to characterize the sort of journalism he was practicing. (The best label he could find was "cultural criticism," which he said was unsatisfactory, after all.) While this "Number 241" was still current, on November 13, 1955, Mr. DeVoto died suddenly. In his twenty years of occupying "The Easy Chair," his editors testify, he had "never missed a deadline," and on the morning following his death—Monday, November 14—the copy came for his final contribution, on time, as always, it being the article that appeared in *Harper's* for January, 1956. One of the great periodical journalistic influences for conservation that we have known can thus no longer be expected to throb month after month. The influence will continue in many ways. Perhaps it will go on most importantly through the other journalists and the thoughtful leaders of public opinion who will follow Mr. DeVoto's example. It will do us all good to observe what this example has been.

Fortunately, "Number 241" was written not only as a sort of anniversary contribution to the magazine. It also was intended as the opening article in a collection made from the magazine's two decades, and likewise entitled *The Easy Chair*. This collection is a volume that will be of great interest and value to any conservationist who is thoughtfully concerned with the place of our natural resource protective programs in our democratic American governmental policies. We are most fortunate

to have it as an aid in an appraisal of Mr. DeVoto's example, and, in fact, as an occasion for, or prompting to, such a consideration.

Conservation important

Bernard DeVoto—particularly through "The Easy Chair" in *Harper's*—made two outstanding general contributions to conservation. First of all by discussing conservation issues in this periodical, forthrightly, vividly, urgently, and from the viewpoint of a journalist-historian discussing only matters of outstanding public importance and interest, he made it apparent that conservation was not a special concern only of enthusiastic outdoor folks. Conservation, as Bernard DeVoto reported it and interpreted it, was a fundamental concern of the American public. It was important. A second great service that Bernard DeVoto performed for conservation was in his demonstration of the need for a vigorous, determined journalism.

This volume entitled *The Easy Chair* is, of course, primarily not a collection of conservation articles. Mr. DeVoto in writing the original monthly articles from which the book's contents were selected tried to keep the subject matter so varied that each month a reader "would not know what to expect when he turned to the column." The thirty-one articles chosen from the two hundred and forty-one are well representative. The fact that Mr. DeVoto's subject was not conservation helps to make so significant his emphasis upon it. Readers may anticipate—and without disappointment—much interesting reading on varied topics, but they may thus value all the more the book's emphasis on conservation.

As a matter of fact, it is not for themselves alone that the included articles on conservation were chosen by Mr. DeVoto. Most of them he arranged in a group which he entitled "Treatise on a Function of Journalism." He cited these articles as a demonstration of the great importance of *Harper's Magazine*, which with *The Atlantic Monthly* provides the only outlet for the writer of his

kind who "wants to bring something to the attention of the public." It is important to us in our appraisal to realize this. Mr. DeVoto wrote, in "Number 241:"

"... I cite the articles about the struggle over the public lands that I have been running periodically in the Easy Chair and the body of the magazine ever since January, 1947. Some have been straight news stories, some have been editorial comment, some have been primarily polemic; but whatever their nature, they have given the subject the only adequate coverage it has had anywhere. No newspaper has covered it well, and that goes for the *New York Times*. Apart from *Harper's* no magazine has more than glanced at it. Presumably I could have published most of my pieces in the *Atlantic*—but where else? Several magazines for sportsmen ran occasional articles about isolated parts of the struggle. In the first year after the story of the landgrab broke—after I broke the story—*Collier's* ran two pieces about it. No other mass-circulation magazine would touch it. The weeklies never got past the fringe. But *Harper's* ran my articles; to run such articles is one of its functions."

Threats to public lands

Thus Mr. DeVoto emphasized that threats to the continued public ownership of our public lands are of great importance, but he was making the special point that during the period of which he was writing there was no medium of publication but *Harper's* and the *Atlantic* where the threats could be "given adequate coverage."

We should not overlook the significance of the fact that he did thus emphasize that the subject was of outstanding public importance. He revealed this by perceiving it himself and becoming articulate. Other outdoorsmen and conservationists had likewise perceived it, but their perceptions were not so important to the public because they were not in the public position that DeVoto was, and they were not articulate as he was.

We should have liked to have had Mr. DeVoto continue for many years, and we truly do need such a champion of conservation among the thought-leading journalists that follow in his train. John B. Oakes, whose "Conservation" department in *The New York Times* is widely read, is one to whom we can look, and there are

others. They all will long revere Bernard DeVoto.

As well as illustrating the importance of conservation in journalism, Bernard DeVoto's achievement also emphasizes our need for journalism in conservation. In the editorials of *Nature Magazine*, in Michael Huda-ba's Washington correspondence in *Sports Afield*, in editorials and articles of such periodicals as *American Forests*, *The Living Wilderness*, *National Parks Magazine*, and *Pacific Discovery*, in the news-bulletin services of the National Wildlife Federation and the Wildlife Management Institute, we do have a journalism of great forth-right reporting and clear-cut state-ment of opinion. Concerns with or-ganizational policies, the temptation to be among those formulating pub-lic policy, and regard for cooperation and cooperators, however, seem to put at a premium the kind of journal-ism in our conservation press and periodical literature that Bernard DeVoto exemplified in these articles now collected in *The Easy Chair*. It would be good for our conservation writers and also editors, most of whom have long been among De-Voto's regular readers, to reread these articles now collected in book form and to ponder them, as indeed it would benefit all thoughtful readers.

Too late to include

Written apparently after the con-tents of this book had been chosen, and in any case not included, was one of Bernard DeVoto's greatest contributions to the growing ap-preciation of areas of wildness, his article in "The Easy Chair" for September, 1955, entitled "Hell's Half Acre, Mass." In it, although professing himself "neither a nature lover nor an outdoorsman," he again gave a persuasive sanction to some of the most earnest recommendations of those who are both. "Though my tastes are metropolitan and I have no urge to be active in the wilds, I agree with the outdoors-men," he wrote; "life would be intolerable if I could not visit woods and mountains at short intervals." He lamented that from his home in Cambridge, Massachusetts, "you must now drive a hundred miles to get to a patch of natural woods large enough to justify studying it." He resented the fact that "the Forest Service is under constantly increasing pressure to reduce the size of the portions of various forests which it

reserves in their primitive condition as wilderness areas." When his boys objected to a new highway's being so routed as to destroy their "Hell's Half Acre" he shared their belief "that Cambridge ought to maintain a few acres of land in a condition of judicious neglect," and he declared:

"... the boys' argument is entire-ly sound, entirely unanswerable. If civic intelligence did not contain a built-in factor of social stupidity, the new highway would be routed up on the far side of the cemetery and these few scarred acres would be fenced off and let alone. If this should cost ten or fifty times as much as taking the highway across Hell's Half Acre, it would nevertheless be an economy—a cash and tax econ-omy—so great that a commission endowed with proper business sense would never consider any other course."

We can indeed be grateful for the writings of Bernard DeVoto that thus so effectively argued the wis-dom of conservation and the sound-ness of efforts to preserve areas of wildness. To have a selection of his writings, including discussions of such topics, available in a book is a good fortune of which I trust we shall make the most.

The Easy Chair. By Bernard De-Voto. Boston: Houghton Mifflin Company. 1955. xii + 356 pp. (5½ by 8½ in.) \$4.

Recent Studies in Avian Biology

Edited by Albert Wolfson. Urbana, Illinois. 1955. University of Illinois Press. 479 pages. \$7.50.

This important technical ornitho-logical volume is published under the sponsorship of the American Ornithologists' Union and is the re-sult of the work of the Union's Com-mittee on Research. The task of this committee, of which the editor of this volume was a member, was to prepare a book on recent research in ornithology. Through this volume it was hoped to stimulate further research and to make available in one place accomplishments of recent studies. Contributors to the volume are David E. Davis, L. V. Domm, John T. Emlen, Jr., Donald S. Farner, Harvey I. Fisher, Herbert Fried-mann, Donald R. Griffin, Carlton M. Herman, Joseph J. Hickey, George H. Lowery, Jr., Alden H. Miller, Robert J. Newman and Alexander Wetmore.



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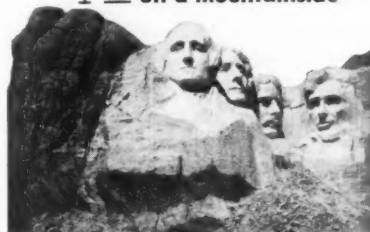
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Briefly Noted

It is impossible to review in length all of the books received. Also, many are of restricted interest. On this page, therefore, is brief notice of recent titles.

Aircraft Today. Edited by John W. R. Taylor. New York. 1956. Philosophical Library. 96 pages. Illustrated. \$4.75. An annual collection of articles on aspects of aviation written by experts.

Tools in Your Life. By Irving Adler. New York. 1956. The John Day Company. 128 pages. Illustrated by Ruth Adler. \$2.95. The story of tools from the earliest day to today.

Fish Saving. By C. L. Cutting. New York. 1956. Philosophical Library. 372 pages. Illustrated. \$12.00. A history of fish processing from ancient to modern times.

Beauty is Everywhere. By Margaret Venable Wilson. Boston. 1956. Christopher Publishing House. 37 pages. \$1.75. Inspiring prose and poetry about the beauty of the outdoors.

It's Fun to Be A Counselor. By Emily H. Welch. New York. 1956. Association Press. 64 pages. \$1.00. Thoughts on the calling of a camp counselor.

The Preservation of Natural History Specimens. By Reginald Wagstaffe and J. Havelock Fidler. New York. 1956. Philosophical Library. 205 pages. Illustrated. \$10.00. Up-to-date methods in the preparation and preservation of specimens for natural history use.

The Myology of the Whooping Crane. By Harvey I. Fisher and Donald C. Goodman. Urbana, Illinois. 1956. University of Illinois Press. 127 pages. Cloth, \$3.50; paper, \$2.50. Scientific discussion of the muscular construction of the whooping crane.

Harry Black. By David Walker. Boston. 1956. Houghton Mifflin. 316 pages. \$3.95. A novel against a background of India and Germany.

The Modern Building Encyclopedia. Edited by N. W. Kay. New York. 1955. Philosophical Library. 768 pages. Illustrated. \$15.00. The meaning of building terms, including tools and various crafts.

On the Wings of the Wind. By David C. Holmes and Marvin Pitkin. New York. 1955. The McBride Co. 204

pages. Illustrated. \$3.50. The dramatic story of the air and weather around us and the behavior of the swiftly changing atmosphere.

Young Kangaroo. By Margaret Wise Brown. New York. 1955. William R. Scott, Inc. 44 pages. Illustrated by Symeon Shimin. \$2.25. Story for children about the life and growth of the kangaroo.

The Flood and Noah's Ark. The Tower of Babel. By Andre Parrot. New York. 1955. Philosophical Library. 75 pages. Illustrated. \$2.75 each. The first two volumes in a series entitled "Studies in Biblical Archaeology" by the Curator-in-Chief of the French National Museum.

The First Book of Sea Shells. By Betty Cabanna. New York. 1955. Franklin Watts, Inc. 39 pages. Illustrated by Marguerite Scott. \$1.95. Introduction to the sea shells and one of the "First Books" in a series by this publisher.

The Amazing Mr. Mocker. By Peyre Gaillard. New York. 1955. Comet Press. 65 pages. Illustrated. \$2.50. Factual yet entertaining information about one of the most fascinating of our birds by a lawyer-journalist-ornithologist.

A Deer in the Family. By John Hartmann. New York. 1955. E. P. Dutton and Co. 60 pages. Illustrated. \$2.50. A charming story of an adopted roe fawn by a Danish family living near Copenhagen. Translated from the Danish by Edith M. Nielson.

Indoor Plants and How to Grow Them. By A. Bertrand. New York. 1955. Philosophical Library. 92 pages. Illustrated in color and black and white. \$4.75. Translation of a book by a French horticulturist and cactus specialist.

Guide to the Stars. By Hector MacPherson. New York. 1955. Philosophical Library. 144 pages. \$2.75. New and revised edition of this little book by a British astronomer.

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Atlas of Paleogeographic Maps of North America. By Charles Schuchert. New York. 1955. John Wiley and Sons. 177 pages. \$4.75. The lifetime work of a man devoted to paleogeography.

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On the Nature of Man. By Dagobert D. Runes. New York. 1956. Philosophical Library. 105 pages. \$3.00. An essay on primitive philosophy by this Austrian philosopher.

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Contents noted

BY THE EDITOR

RECENTLY ON THE TV PROGRAM "LASSIE"

we thought we were going to have a fine lesson on hawks and their value, but somebody "goofed." Young Jeff, hero of this popular show—after Lassie, of course—had acquired a red-tailed hawk. With his pal he had trained the fine bird to come to his hand. When the boy's mother and grandfather both ordered him to get rid of the bird, Jeff read them a lecture on the value of hawks, pointing out that there was even a place called Hawk Mountain in Pennsylvania that was a sanctuary for hawks. Gramp reluctantly allowed the boy to leave the hawk in the barn, but warned that there were hens there. Jeff assured Gramp that the red-tail would not kill chickens but was valuable in keeping rodents in check. Left in the dark barn, a chicken is killed, presumably by the hawk, the noise awakening the family. Gramp is for doing away with the bird right away, but finally yields to Jeff's plea that he be allowed to liberate the hawk. Come morning Gramp finds that the bird has returned to the barn and another chicken has been killed, so sets off to borrow a shotgun, repeating that the "only good hawk is a dead hawk." Heartbroken, Jeff bows to the evidence, but gets permission to poison the bird himself. Of course, the red-tailed hawk is one of the most beneficial of his kind. The killing of the chicken in the dark by any hawk is most unlikely, and the bird, unlike certain owls, would not have returned inside the barn. So the viewer is left with the conviction that Gramp's idea about hawks is the correct one, and opportunity for an excellent conservation message is muffed. We thought that it was going to be discovered that a weasel or large rat had killed the fowl, thus absolving the hawk, but we were doomed to disappointment, and to some disgust at this unnecessary perpetuation of prejudice.

"FREEDOM OF THE AMERICAN ROAD" is the title of a 120-page, large-size book recently published by the Ford Motor Company. It is the result of a study of the highway situation in the United States, which proved that you cannot talk about highways without considering traffic and safe driving also. The study revealed that able highway and traffic safety experts are not in short supply but that these individuals need public understanding and support. Outstanding accomplishment was found in many areas and reports on these are brought together in this interesting book, which is divided into three sections dealing with "The Highway," "The Traffic," and "The Driver." Perhaps we were asking too much, but we had hoped that the highway environment, its use and abuse, would come in for

consideration. It does not. Emphasis is on the utilitarian instead of the esthetic; on traffic flow rather than that which it flows through; on the competence of the driver and the machine he drives instead of roadside conditions that can and do affect safety on the highway. Some day a real study is going to be made of the menace of the attention-distracting billboard and the ill-placed roadside enterprise. With the billions spent, spending and to be spent on our great high-speed highway system, the people who foot the bill have a right to expect protection from such dangers.

TWENTY-TWO ACRES OF NEW YORK'S CENTRAL PARK

are known as The Ramble. This is an area of hilly woodland and has been a favorite place for migratory and resident birds, and migratory and resident bird enthusiasts. In May, 1955, it was announced that a grant of \$250,000 was to be made by the Florina Lasker Foundation to be used to convert fourteen of the acres into a recreation center. Opposition to the sacrifice of this bit of wildness in the heart of a great city immediately arose, and waxed vociferous. So strong was the protest that the grant was recently withdrawn. Following this, Robert Moses, Commissioner of Parks, announced that a sum almost equal to that of the grant would be spent to care for The Ramble and make it serve even more effectively the bird hospitality it has hitherto offered.

THE CHRISTIAN SCIENCE MONITOR, with its issue of January 26, 1956, began a series of articles under the group title of "Our National Parks; A Heritage Worth Saving." The series is being written by Max K. Gilstrap of the newspaper's staff and started with a discussion of "Mission 66." This is a program looking to making the parks equal, by 1966, to the presumed public demands that will be made upon them by that year. Mr. Gilstrap's articles are based upon personal visits, research and extensive discussion with park visitors, park staffs and individuals interested in park problems. This is a positive contribution to the understanding and appreciation of the components of our National Park System. If we may be pardoned a personal note, this series reminds us of one we wrote as a *Monitor* staffer in late 1921 and early 1922. At that time there was a serious threat from a proposed dam in the Yellowstone River within Yellowstone National Park. Park supporters were far fewer then than they are today, and we like to feel that the twenty-three articles we wrote made some contributions to the defeat of that earlier threat.

R.W.W.



The sagelands. From them came a breed of men the West may never know again. But America will always need them.
A sage-floored valley of southern Idaho.

There is a special quality in

The Gray-Green Sea of the Sage

"**Y**EP, young feller, that's where a man kin ride all day an' never see no one. Out there yuh kin see clear t' God's horizon—an' some men kin see beyond." With bony finger the Old Homesteader pointed away over the sagebrush and lava lands of southern Idaho. And again studying my acquaintance, I saw a face lighted with rugged honesty, bronzed by a wind blowing clean and fresh from across half a thousand miles of high desert. "Some fellers ther don't know a lot about nuthin' says it's jest brush, an let's get rid of it. But I knows some real hombres as would rather have the smell o' sage than all the hundred dollar bills them promotion slickers kin pile up. Yuh ain't never alone out there," he affirmed, "not s' long as yuh take the trouble t' interduce yerself an' get acquainted with yer Maker."

All day I had motored along the Snake, had seen some of the "improvements" as well as benefits wrought by the expanding Snake River and Minidoka Projects. There had been, unforgettably, the deserted river bed, the flooded basins, the series of great, silent falls. As

the Old Homesteader graphically reminded: "We kin use some of it. But when them politickers tells us the desert'll bloom like a rose, what they mean is more pertater dig-outs and' more dirty backyards."

"Me and the missus has still got some good ground by the creek way back in the cove. It'll see us out. Only I'd like the boy to uv know'd this here country like we did." The sweep of his arm took in the silver-sage-floored valley, the gray-velveted benches and the blue hills lost distantly in haze-hidden horizons.

The tangy aroma of sagebrush wafted to our nostrils with the freshening caress of the breeze. I knew his thoughts: The never-forgotten scent of the sage. The Wide Open Spaces. From them came a breed of men the West may never know again. But America will always need them.

"When we git t' monkeyin' around too much with what the Old Man put out fer us we sure gets ourselves into it bad," the sagebrusher concluded, shaking his head. "Leastways them fellers don't never figger up

what we're fixin' t' lose. Mostly, I guess, 'cause they'll never know."

I watched the Old Homesteader trace the scanty track of road down the sage-dotted slope. There was a roomy sag in the seat of his tired pants. His shirt sleeves were ripped and torn. Yet they hung on a figure straight, wiry and lean. Plainly he was not interested in a bigger car than the other fellow; or beating him at the next red light. The man had learned to live with the sky, the sage and the Spirit of the Hills.

Nothing out there in the sage? Those who say it see only today's burning overgrazed flats, crusted alkali pools, dead creeks, the rattlers, the spreading beds of prickly pear. They have never known this vast land,

Sagebrush! Over the purpled plains,
carpeting with silver-gray the valleys
and mesas, roaming with juniper and
pinon, who can forget it?

By JOHN LINDSEY
BLACKFORD

Photographs by the Author, unless otherwise credited.



clean and new, dressed with sagebrush, fresh-scented after rain, gold-flowered with balsam root, waving with bunch grass, smiling gaillardia, flirting blue flax and prairie smoke. They do not recall that it should have the sage hen's thousands gathered along willow-bounded streams; or have they ever paused enraptured by the sage thrasher's liquid song. Willingly they concede the "cure" is renewed and wholesale stripping of sagebrush from the withered land!

Too often the bulldozers disregard the fact that sagebrush is valuable browse, rich in forage fats and proteins. If it has not endured in prosperity, can the acclaimed substitutes withstand the same overload of hungered, trampling stock? Will there be sufficient profitable margin of forage in the introduced grasses to afford their maintainance? For maintainance they require. Sagebrush, or northern desert shrub, is the *climax formation* of these vast bench and prairie lands—the highest floral expression and achievement possible to the climate. Without a radical alteration factor, such as provided locally by irrigation water, the land must return to

the sage, or to what is loosely described as badlands.

All pioneer, developmental and restorative plant successions lead to, or return, the land to its climax vegetation. Only when new forage plants are maintained, and return extra yield above cost, may widespread destruction of native cover be justified. Across such limitless reaches of the continent, Americans would do well to evolve an economy in harmony with the universal sagebrush, to develop grasses that prosper with it and share the grazing load. In these great marginal range lands, that may be the measure of success.

Over immense stretches of the continental Great Plains, across the Great Basin, upon adjacent and intervening arid mountain slopes and plateaus of western

North America, sagebrush is the climax dominant. How efficiently it has fitted itself to the soils, the elevations, the slope exposures, the mineral concentrations, the climatic variations of this mighty topography is best told by its numbers of species and varieties. They are the achievement of an epoch in Nature's laboratory of the high desert. They, with their plant and animal associates are the end results, "the final or adult community." Since man cannot do more than interrupt their sway, he should study them well. Only the unthinking would spurn and extirpate the sagelands.

Sagebrush ranges the Upper Sonoran, the arid Transition, invades the Canadian Life Zone, and may even reach irregularly up through forests of high mountain slopes to contact alpine meadows near timberline. Thus elevations from near sea level to 10,000 feet are encompassed. *Artemisia* thrives with seven inches of rainfall. With an "abundance" of twelve it may yield to its partner, bunchgrass.

Desert and Plains Indians found happy living with sagebrush. The Hopi roasted its aromatic leaves with



Soft, pervading notes of mourning doves, and their sharp-winged flight with fledgling young, ever recall to us the scented sagebrush plains.

In dwarfed sagebrush stands where openly grown with weeds and prairie grass, the vesper sparrow cleverly conceals her nested and speckled eggs.

sweet corn for the flavor. Cahuillas gathered and ground its ripening seeds into meal. Many tribes used the bitter-leaved tea for tonic, and commonly as vermifuge and antiseptic for wounds.

More than thirty years ago Pliny Hawkins told how the old cowpuncher remembered the sagebrush: "... how black the sage looked in March while there were still snow patches among the shrubs; how the sage-hens stalked about, picking the new, green leaves; how pleasantly pungent the odor came up after rain, or when the sun hit it in the morning as he stood drinking coffee from the old tin cup. When the 'dogies' came down for water at noon, wasn't it fine to ride into the tall sage away from the flies and stretch out in the shade? When the mosquitoes were bad, sage smoke, sour and oily, would make them quit if anything would... Was there anything that would heat an iron, or burn the biscuits quicker?

"He remembers how the lark-bunting soared up into the blue and slowly dropped into the sage, letting his music go like spray from a waterfall. There were meadowlarks and ground sparrows, cottontails and jacks, rattlesnakes and prairie dogs, owls and eagles, lizards and ants, all doing things among the sage. He cannot forget how he crept half a mile through the sage on his belly to get a shot at the buck antelope that made the fryingpan smell so good...

"He saw the Indians light their friction fires with the lint of the sage bark, and once when the icicles were hanging from the stirrups and the blizzard making forty miles an hour he thought of this and got a fire with a match stub. It wasn't five minutes till he could 'roll one.' Pretty comfortable around that sagebrush fire!"



The aromatic, western sagebrush species are told from kindred herbaceous wormwoods by their woody stems. Both belong to the Composite Family. They are unrelated to, and should in no way be confused with true sage, *Salvia*, a genus belonging to the Mints.

King of the sagelands is big sagebrush, *Artemisia tridentata*. It may struggle as a stunted shrub a few inches high; or flourish as a small tree fifteen feet tall and four inches in diameter. It ranges from the Great Plains to the High Sierra, from the basaltic scab lands of the Columbia Plateau to southeastern California. It wears the state flower of Nevada. Its roots may go down thirty feet. And it tells you in prosperity that it grows on non-saline and fertile soil. In pure and un-

broken stands big sagebrush clothes an empire in the West. Its triple-toothed silky leaves silver the distances as its shrubby legions carpet flat-floored basins, climb to the shelving rimrock and scramble up the painted buttes. In bloom this is the legendary purple sage of fiction.

Black sagebrush, *A. nova*, loves the shallow, stony soil of dry slopes and mesas from Montana to New Mexico and California. Soft, silvery, fringed foliage of mountain or arctic sagebrush, *A. frigida*, grays the rolling prairies of the Blackfoot Indian country, climbs high in the Colorado Rockies, and sweeps across rocky plateaus of the Navajo lands of northern Arizona. Its bitter tea was thought an excellent remedy for mountain fever. Three-lobed sage, *A. trifida*, is common on dry, over-heated plains.

Bud sagebrush, *A. spinescens*, a spiny shrub resistant to drought and overgrazing, dominates many broad valleys and mesas of the Great Basin, often in nearly pure stands. Yet in saline soils of the sun-blistered depressions it may grow no more than four inches high. The white, narrow-lanceolate foliage of silver or hairy sagebrush, *A. cana*, is seen from dry plains to 10,000 feet, down through the mountains from the north into Colorado.



In Yellowstone Park the lighter color of this three-foot shrub marks it as next in abundance there to big sage. Sand sagebrush, *A. filifolia*, occurs commonly on the Great Plains, seeking loose sandy soils on its journey from Nebraska and Wyoming into the Southwest. Many related forms widen the gray-green domains of the sage.

As one drifts through the silver-gray of the sagebrush, its wind-swept floor, vast, featureless flats, and uncertain distances give a sense of pervading loneliness. But presently this is broken by an exquisite tinkle of sage sparrow song. Each small performer, across the gray-green sea of the sage, lifts his bill to the azure blue and pours out a lively lay to the shimmering wastes.

Where *Artemisia* prospers and its woody stems grow to resemble gnarled trunks of a dwarf wood, Brewer's sparrow, or "sagebrush chippie," trills a happy insect ditty in chorus with striped friends.

A lanky gray bird dodges away with startling strides,



PHOTOGRAPH BY GEORGE M. BRADY

Burrowing owls bow oddly from badger mounds in the sagebrush country, or view the visitor with wonder-eyed curiosity.

"Redtop," the elusive green-tailed towhee, is glimpsed in sagebrush borderlands, and upward where sage invades the scattering yellow pine.

its long, white-cornered tail up-tilted. Over vast western plainslands the sage thrasher is wholly typical of this shrub-level habitat. "Only the great sagehen . . . shows such partiality."

A. C. Bent has written well of the thrasher's song: ". . . poet of the lonesome sagebrush plain, one should visit him in his haunts in the gray of early dawn, before the chilly mists of night have lifted from the sea of gray-green billows that clothe the mesa farther than one can see in the still dim light of the coming day. As the veil lifts with the rising sun, the mists roll away, the shadowy bushes take definite form, the vast plain is spread out before us in all its soft colors, and scarcely visible in the distance, a gray-brown bird mounts to the top of a tall sage and pours out a flood of glorious music. . . . In pure sweetness of tone the song is fully equal to that of the mockingbird . . . full of melody and tenderness."

Chief sangeland citizen is the sage grouse. Once, in

uncounted coveys, the great cock-of-the-plains "lived and died with the sage." Wrote Dr. Grinnell to Major Bendire: "In October, 1886, when camped just below a high bluff on the border of Bates Hole, in Wyoming, I saw great numbers of these birds, just after sunrise, flying over my camp to the little spring which oozed out of the bluff 200 yards away. Looking up from the tent at the edge of the bluff above us, we could see projecting over it the heads of hundreds of the birds, and as those standing there took flight, others stepped forward to occupy their places. The number of Grouse which flew over the camp reminded me of the oldtime flights of Passenger Pigeons that I used to see when I was a boy. Before long the narrow valley where the water was, was a moving mass of gray . . . there must have been thousands of them."

The soothing, moonlight voice of the poor-will comes typically from rocky, bouldered sage-grown terrain; and at purple dusk from low scattered greasewood and sage of the warm valley-plain. In open, dwarfed stands, commonly where grown with grass, the hymnal of the vesper sparrow is the serene song as evening comes to the land of sage.

On barren alkaline playas, across open sagebrush flats where greasewood and *Chrysothamnus* accompany the sage, horned larks make their hardy home. How joyful to meet with family bands of western meadowlarks

when the adventuring young can scarcely top the tall sagebrush in covering flight. The rusty cap of "Red-top," the green-tailed towhee, is continually glimpsed in sagebrush borderlands, and upward where sage invades the yellow pine.

Quaint burrowing owls bow oddly from badger mounds in the sageland. Nighthawks plunge in booming flight. And of sunbathed mornings from the ribboned green of its winding creeks—willow, wild rose and sage—the electric blue of the lazuli bunting flashes a metallic gleam.

Sagebrush! What would the wind-swept western prairie lands be without it? Over the purpled plains, carpeting with silver-gray the valleys and mesas, hemming the saltbush-encircled sloughs of the cracking, white alkali flats, roaming with juniper and piñon, who can forget it?

The blazing sagebrush fire, the looping lariat and cowboy yell, the red branding irons, the dust of the herd, the stampede—they all belong to the undying saga of the sage.

As I gaze out to the gray-green wastes and catch the sweet tinkle of the sage sparrow's lilting lay, the words of the Old Homesteader come stealing back to me—"Whenever I hears thet happy little feller's song I'm minded t' consider thet he too knows his Maker mighty durn well."



NO TRUMPETS, PLEASE

(For Alan Devoe)

*Even White-foot, the mouse, will sense him gone,
Sniffing at the knot-hole in the floor.
The wary doe that hides her newborn fawn
Will surely know. And at his woodshed door,
Mephitis, who withholds the reeking spray,
Having no fear, must wonder, if skunks can,
Where his friend is. And almost any day
In wood or field some memory of the man
Will cause the antlered buck to lift his head
And read the wind. He will not reason why.*

*Remember how, the vixen mother dead,
O tawny puplike cub, lonely and shy,
You followed this one through the drifts of snow,
Feeling his friendliness. The wild on bill,
In sky, in stream, or dark and deep below,
All knew him well— must know his spirit still. . . .
Then softly, at The Gates. No loud alarms.
A new Saint Francis mounts the shining stair,
Birds on his shoulders and his gentle arms
Cradling the small furred out of everywhere.*

Elma Dean

*The moon snail of the
beach is a*

Hunter in Low Gear

By G. M. and H. V. DAETZ

Photographs by the Authors



Roaring surf.

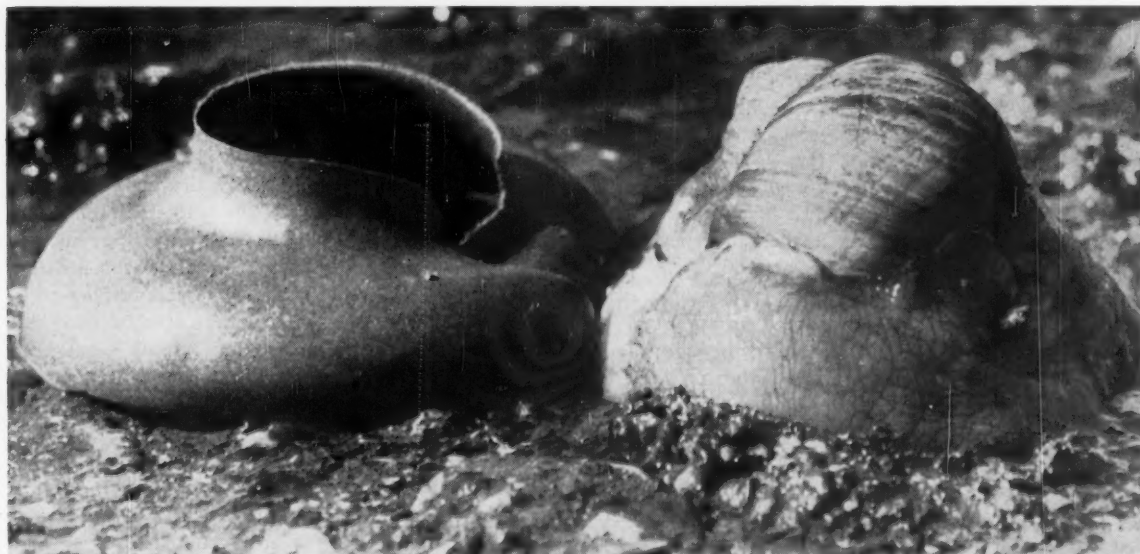
PERHAPS more people know a moon snail when they see one than almost any other marine snail. Beauty, extraordinary talent, or being a nuisance are sure ways of attracting attention. The moon snail can modestly claim acknowledgment on all three counts.

Shell collectors pridefully comment on the delicate shades of color inside this creature's large shell. Scientists take sides as to how the snail bores holes in its victims. Commercial clam raisers search for it and destroy it when the moon snails "bug their beaches." But the mollusk continues to plow happily through mud and sand.

The moon snail discussed and pictured here is Lewis' Moon Snail of the Pacific Coast. It is one of several western species, which have Atlantic Coast relatives, all with similar habits of life. These snails do not look like vicious, predacious creatures. Out of the sand they are furrow-browed citizens, the adult mollusk wearing

a large, warm-toned, beige shell four to five inches in diameter. The moon snail really seems to be wearing the shell rather than carrying it as a home, for the huge foot of the creature dwarfs the shell and buries the lower edge of it in the surrounding mantle. There is so much body mass that it does not seem that it could be possible for the snail to draw itself completely into its shell house. But the creature can do it in a hurry, as snail speeds go.

Pick up the moon snail and poke it under the mantle and its ponderous foot begins to curl and compress, squeezing a minor flood of salt water from the tissues. The moon reduces in size as magically as a wish, pulls into its shell and tightly seals the shell entrance with a translucent, horny-material door called the operculum. It is then safe enough, but hardly comfortable, for it cannot live long enclosed without fresh salt water to wash over its gills.



In the moon snail's sand collar are thousands of her tiny eggs that will hatch out into larval creatures and swim about freely in the water. Few will survive. Some will be drawn into the waiting siphons of clams and be digested; clams that themselves could become food for adult survivors.



The snail bulldozes down under the surface mud and sand for his clam prey. Moving in extremely low gear and with a lot of traction from his broad, powerful foot, the ground piling up before the snail shows a lot of power used effectively.



This countersunk hole, a moon snail drilling, is usually bored near the clam's hinge.

The beauty of a moon snail lies in its simple asymmetry and the economy of line of its five or six whorls. When this snail crafts its egg case the smooth graceful curves are used again. The cases are so regular in shape that they have been mistaken for machine-made discards of civilization. They are a riddle when first seen by the novice. Their texture is sandy leather and they are known as sand collars.

In the mixed-up sexual world of snails the moon snail is conservatively unisexual; each animal has either male or female sex organs only. The female snail pushes the gelatinous eggs from her mantle cavity in a thin sheet. The eggs pick up a thin layer of sand on either side; and the egg case grows, clinging to the large foot of the female, taking its shape. The collar wears the color of the beach from which it came. In Puget Sound, Washington, the collars are black; on southern Oregon beaches the collars are a warm beige that almost matches the snail's own shell color.

When the moon snail collar disintegrates, it releases a great number of tiny, free-swimming larvae into the

tidal waters. Most of these larvae are eaten by established tideland animals. Many are sucked in by the siphons of clams, possibly the same clams that will be food for an adult moon snail plowing beneath the surface of the tide-covered beach.

A hunting moon snail bulldozes along beneath the surface in several inches of sandy or mud-mixed bottom. When it finds a clam's necklike siphon extending to the surface, the snail tries a bite. The clam pulls its siphon into its shell and slams the doors—if it can. Some clams are "gapers." That is, they cannot completely enclose themselves in their shells. If the clam is a gaper it had better be deep in the substratum or the moon snail will ingest the clam, the snail poking its hose-like proboscis into the opening and eating out every bit. If the clam is a tight-shelled "little neck"—a commercially valuable species—the meal is slightly delayed while the snail bores a neat countersunk hole through the shell. It is unlikely that a moon snail ever has to kill a clam by suffocation, that is, by surrounding the shell with its foot until the clam dies from being deprived of oxygen.

It takes less time for a moon snail to bore through the shell and eat a clam than it does for a retracted clam to die by this means. One fact is certain, any clam that has had close contact with a moon snail has "had it."

Even with its large size—as snails grow—and its beautiful coloring on the inner side of its shell, the moon snail would not be half so well known if it were not for the way it uses its radula. The radula, a flexible file-like mechanism in the mouth, is a common rasping tool among the higher mollusks, including even the octopus. But most snails go about happily rasping vegetation into shreds and swallowing the remains. The moon snail uses its radula as a drill to bore holes through clam shells. These holes are always near the valve hinge, for some undetermined reason. Having cut out a back door, the moon snail inserts its proboscis and eats the clam.

The hole bored by the moon snail is a work of art, smooth to the eye and neatly countersunk. It has attracted the microscopes of students of mollusks on both coasts and has caused controversy as to just how the moon snail does it. The beautifully round counter-



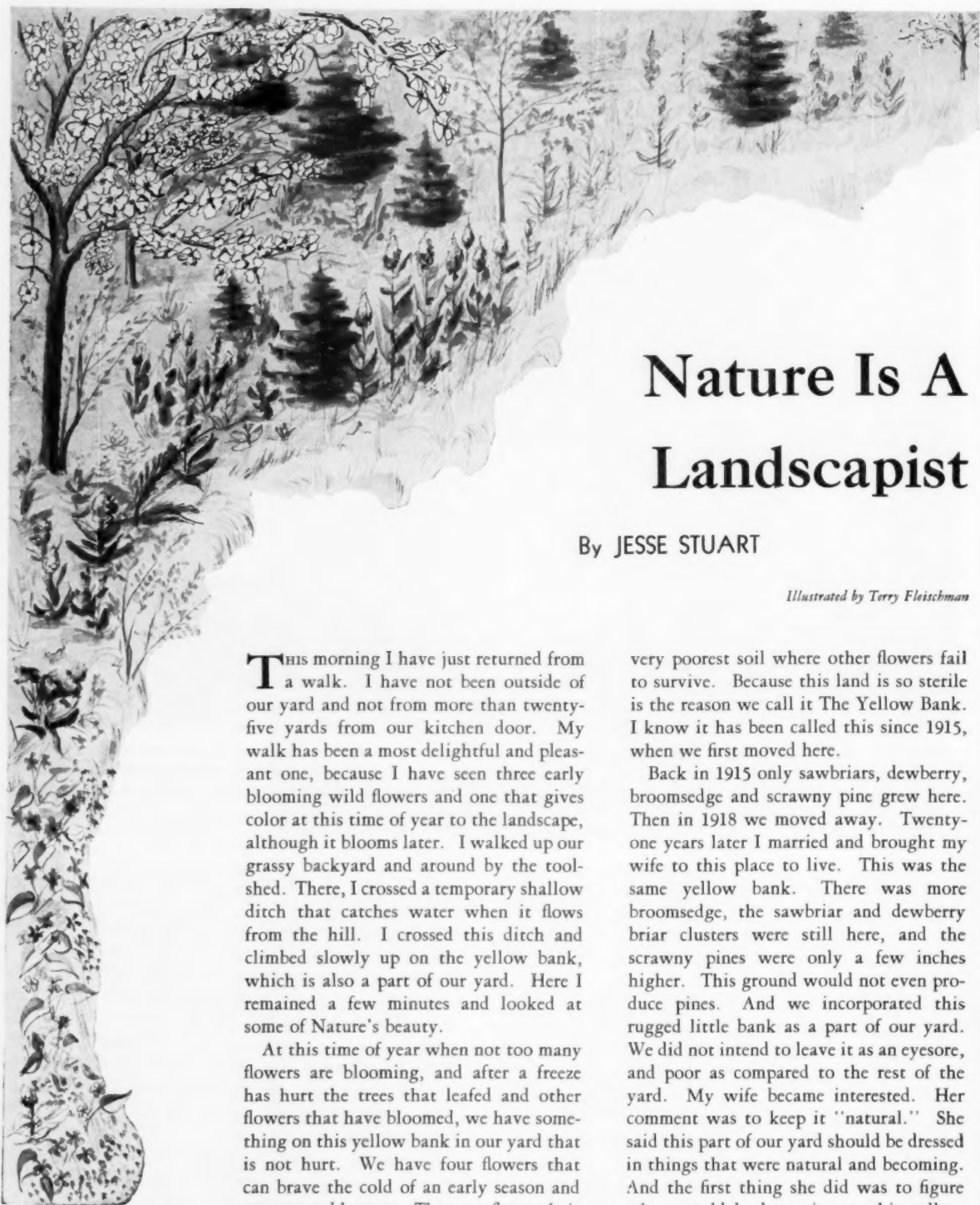
When you see the moon snail's shell riding atop the large, meaty foot you wonder if it can actually get itself completely into the shell. It can. Pick it up and prod it in the mantle and it will compress its muscles, wringing water from them so rapidly that it will stream down your arm. The snail will draw entirely into its shell, closing its door, a horny, orange operculum.

sinking of the hole gave rise to the theory that the moon snail did his boring with acid instead of the radula, using the radula only to strip away the leathery, acid-resistant covering of the clam shell, called scientifically the periostracum.

Observers of moon snails in aquariums have established the fact that moon snails have been observed to bore into and eat a clam an average of one every twenty-seven hours. This seemed too fast a job for the weak acid the snail is capable of secreting. Other observers brought out the information that moon snail holes were found in the chitinous egg cases of certain sea creatures that would not be affected by acid. Finally, microscopic examination of the drilled holes showed scratches that could be made only by the radula. But, even so, the holes are not a mass of scratches. It is possible that a mild acid solution would soften and speed the abrasive scouring action through the calcium layers, and still leave a relatively smooth-surfaced hole as though scoured with steel wool. But if the moon snail can not use acid saliva to help, it is certain it can use the radula alone.

The radula is a flexible, belt-like structure studded with regular, chisel teeth. The teeth wear off at one end and replacements keep moving up from the lesser used section. As the snail's mouth opens and moves forward in a licking motion, the exposed radula is drawn backward rapidly, the teeth spreading erect on the belt as it takes its file-like cut. On the return movement the teeth lie flat. All snails have these built-in files. And, although the majority use them to cut vegetable food to ribbons, it is a good enough tool to permit marine forms—including whelks and tritons—to turn on their molluscan relation as predators.

Clam hunters, except the actual owners of the beaches, are not welcome in the great clam beds of Puget Sound. So on any of these beaches the moon snail is declared an outlaw and destroyed. Although it does not drill into oysters, the oyster raisers claim the snail disturbs the oysters when it plows through them on the surface searching for clams in the mud beneath. Man has been the moon's enemy in the past, long before the white man knew of the Pacific, for the Indians (*continued on page 219*)



Nature Is A Landscapist

By JESSE STUART

Illustrated by Terry Fleischman

THIS morning I have just returned from a walk. I have not been outside of our yard and not from more than twenty-five yards from our kitchen door. My walk has been a most delightful and pleasant one, because I have seen three early blooming wild flowers and one that gives color at this time of year to the landscape, although it blooms later. I walked up our grassy backyard and around by the toolshed. There, I crossed a temporary shallow ditch that catches water when it flows from the hill. I crossed this ditch and climbed slowly up on the yellow bank, which is also a part of our yard. Here I remained a few minutes and looked at some of Nature's beauty.

At this time of year when not too many flowers are blooming, and after a freeze has hurt the trees that leafed and other flowers that have bloomed, we have something on this yellow bank in our yard that is not hurt. We have four flowers that can brave the cold of an early season and manage to blossom. They can flaunt their beauty to us who love to see it in the early spring. They are egotistical flowers and I like them because they bring so much enjoyment to us at this time of year when the world still has a lot of drabness. And these flowers can and will grow in the

very poorest soil where other flowers fail to survive. Because this land is so sterile is the reason we call it The Yellow Bank. I know it has been called this since 1915, when we first moved here.

Back in 1915 only sawbriars, dewberry, broomsedge and scrawny pine grew here. Then in 1918 we moved away. Twenty-one years later I married and brought my wife to this place to live. This was the same yellow bank. There was more broomsedge, the sawbrier and dewberry briar clusters were still here, and the scrawny pines were only a few inches higher. This ground would not even produce pines. And we incorporated this rugged little bank as a part of our yard. We did not intend to leave it as an eyesore, and poor as compared to the rest of the yard. My wife became interested. Her comment was to keep it "natural." She said this part of our yard should be dressed in things that were natural and becoming. And the first thing she did was to figure what would be becoming to this yellow bank. She observed closely what, if anything, could or would grow on this soil.

We found one small dogwood growing here. We knew if it would grow, then we could set others. We left several of the pines, especially at the upper end of the

yard. We left a few persimmons. And down on the front of the bluff we left more pines, a wild plum and several pawpaws. They had sprung up from this soil so we figured they ought to grow. Then, we did something I had never seen anyone else do around here, and several people laughed at our doing it. We let the little black sumac grow, which is a sign of the poorest land in Kentucky. None of our natives ever thinks of planting anything where this tree grows.

We let mullein stalks grow on parts of the yellow bank where not even wild grass or broomsage would. Mullein was beautiful blooming in summer, flaunting its small yellow blossoms. People laughed at first, but later agreed the mullein stalk, which was considered a harmless but obnoxious weed, made a beautiful flower on our yellow bank. Many of our neighbors followed us and planted them on their thin soil. Our green pines throughout the year were nice and our dogwoods, blooming in the spring, made white trembling sails of blossoms in the spring winds. Yes, and we left two redbuds for pink sails to flutter in the winds at sunset. Our persimmons leafed and grew, and our pawpaws bore a few odd-colored lavender blossoms in early spring. Our wild plum was a white sail of blooms and alive with buzzing bees.



But there was something more to the yellow bank. We had flowers to bloom before the dogwood, the pawpaw, wild plum, redbud, black sumac and mullein. And these flowers were what I went to see this morning and I shall go again in the morning and the following morning and enjoy their season of spring beauty as long as they last. Our yellow bank is now covered with baby-tears as it is each spring. The frost and freeze never seem to be able to kill this exquisite, beautiful, fragile little flower. These pale blue blossoms are everywhere. And mixed with the babytear blossoms are the little golden cinquefoil blossoms, almost like tiny golden stars. We used to call this plant sankfield and the plant is very similar to a wild strawberry. I used to mistake a patch of "sankfield" for wild strawberries. But the difference is wild strawberries grow in fertile land and have white blossoms and bear delicious fruit, while the cinquefoil grows in the poorest kind of soil, has yellow blossoms and does not bear fruit. So many old cemeteries and sunken graves are virtually covered this time of year with blooming cinquefoil. The cinquefoil runners hug close to the earth and conceal its scars. And our yellow bank this early April is covered with it. The yellow blossoms are like so many stars lighting up a dirt-dark sky, except the sky and stars are beneath one's feet and one reaches down and not up for the stars.

Then, all over this bank, wherever there is a leaf, a tuft of broomsedge, or some little protection, there is a clump of blue violets. And these beautiful things will

grow in any kind of soil. They will bloom under the leaves of last year and above them if they can; they will bloom under the protection of a pine, or a lichened rock, or a tuft of sod of an overhanging bank. So here is a carpet of the mixed colors of light-blue, deep, dark-blue, and golden. This carpet is under the green pines and the leafless trees.

Then there is a plant that grows profusely on this yellow bank, which my mother always called "rabbit tobacco." It is gray-lichen in color and belongs to the mullein family, only it never grows up into a tall stalk. It hugs close to the ground and leaves its patches of gray-lichen on our rugged, yellow bank where these three early wild flowers have spread their blanket of light-blue, deep blue, and gold.

Our yellow bank is no longer a dirt-yellow bank where not anything will grow. The growth has been too small to cut. In early autumn we have the white daisy, goldenrods, and black-eyed susan. We leave the dead stems of the flowers and grass and weeds on the ground. We never rake this bank. Nature re-fertilizes this earth, for the leaves fall from the trees and the needles from the pines and rot here. Now, year by year, something is added to the topsoil. We have not spent a dime for fertilizer for this hill. We have not spent a nickel for shrubs and flowers. We let what grew naturally here continue to grow. We have followed the voice of Nature while working with this part of the yard, and this is why it has become one of the most attractive parts of our yard.

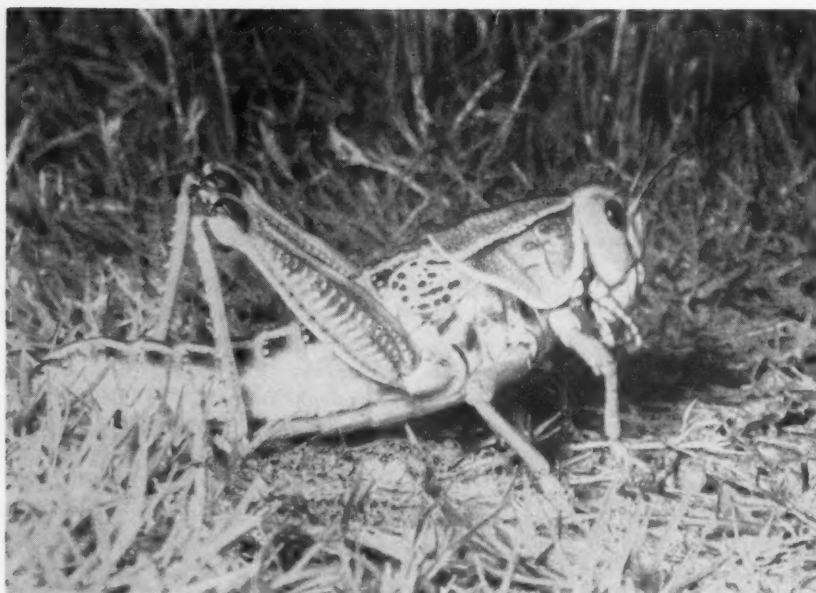
Now in early April, our first flowers have spread a very pretty blanket over the laps and folds of this rugged terrain. By the time these flowers are through blooming the dogwoods, redbuds, pawpaw and wild plum will be blooming. When these blossoms have fallen, the black sumac will be blooming and later the mullein will blossom. And the pines stay green through the four seasons. This half acre of rugged terrain takes our eye and the visitor's eye the four seasons of the year.



The bank is firmly rooted in place by the plants to which it is host, and thus there is a community of interest—solid hillside and beauty of growth at any and all times of the year.

And so many people have asked us who landscaped it. We have to say that no one landscaped it except Nature. We took out a few of the trees and the pines thinned themselves. Where they were too thick the weaker pines died and left stronger ones. And when they asked us if it was expensive to fix a yard like this, when we tell them all we have in it is our own labor, they look at us unbelievably. But this is the truth about this portion of our yard, which repays us throughout the year with a natural beauty that the rest of our yard, which we have planned, does not have. 🌸 🌸 🌸

SALLY WAS A LUBBER



A profile view of "Sally," the lubber grasshopper that proved to be an interesting and surprisingly personable pet. The author says that these insects are large enough so that their "working parts" can be easily studied. Below, the lubber roosts on the author's hand prior to being taken out for one of her walks.

EVEN a lowly grasshopper can become an enjoyable pet. At least this was true of one particular grasshopper, a lubber we named "Sally." Entomologists would call her *Brachystola magna*.

The lubber makes a particularly good pet for several reasons. Its wings are vestigial, really almost completely lacking, and thus these grasshoppers can be taken for walks outdoors without much danger of their flying away. They can run swiftly and leap far, however, and may disappear in the strangest places.

Lubbers do not spit "tobacco juice" on the hands of their captors. They are large enough so that most of their "working parts" are easy to study in animated operation—such as the way they use their palpi in a handlike movement to carry food to the mouth.

It may sound foolish to "walk" a grasshopper, but Sally was taken for a daily stroll, just as a dog is taken out for an airing. All creatures need exercise under natural conditions, and most of them require fresh air and sunshine. Sally was no exception. During her walks she was permitted to race through the grass, leap over obstructions, clamber up succulent leafy plants of her own choosing, and feed to her heart's content. I truly believe that she came to know and enjoy these walking periods.

Her place of confinement was a two-quart jar, with plenty of ventilation at the top. Covering the bottom



of her cage was a layer of dirt, about three inches thick. The jar also contained a large stick, reaching from bottom to top, and upon which she could crawl.

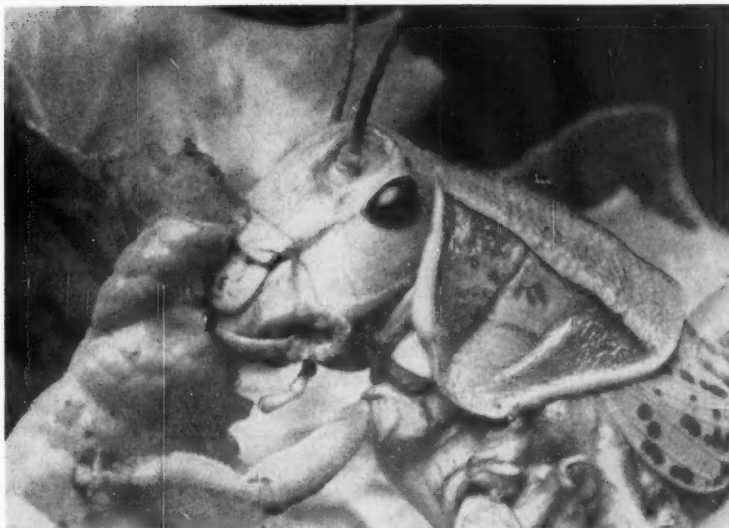
During the first days of her imprisonment, Sally was apparently fearful. Each time I reached inside her jar, she became excited and thrashed about in agitation. Her powerful hind legs, covered with tiny sharp spurs, thrust violently to protect her back.

However, before the first week was over, she somehow seemed to realize that my hand offered no danger to her safety—in fact, that it meant food, as a leaf of lettuce.

By JOHN R. CLAWSON

Photographs by the Author

Sally was not a beauty, the author freely concedes. Here she is busily at work on a large piece of lettuce in the garden. Below, the grasshopper rides on the author's foot.



Many insects smell or taste with their antennae. For Sally to recognize my hand, would be much the same as for you to recognize a cup of coffee, even though you were blindfolded. Always she touched my fingers with her antennae. Finally she summoned enough courage to crawl on my hand. Then we went outside for our first walk.

These walks became a daily event. When it came time to go outside, I had merely to place my hand near her solemn, mule-like face. After giving my hand a speculative brush with her antennae, Sally would crawl up my finger for a ride.

Then a new game developed. Further to spur exercise by leaping, I would pretend to tramp near her with my foot. She would scurry madly away. It became a game of tag. Just as she learned the feel of my hand, she soon appeared to recognize that my pounding foot was not really intended to crush her. At times, she would sit placidly, paying no heed at all to this threat. Usually, however, the lubber seemed to like the game of tag. After she became tired of fruitless leaping, she would turn around and crawl laboriously up on my shoe top. Perched like a sentinel on my toe, she would ride like a haughty queen as I walked about the yard.

Many times I left Sally alone in the backyard. At first, however, I was careful not to leave her, for fear she might escape. When I was nearby, she would travel,

usually southward. But when I moved to some distance, she usually remained exactly where I left her. This came to mean that I could work in the yard, while Sally basked in warm sunshine.

One day I forgot Sally was out. I dressed for town and was gone three hours before I suddenly remembered the grasshopper had been left in the garden. Fearful that my demanding pet had wandered far away, I rushed home. There she was, clinging to the same plant where I had left her! I placed my hand near her face. After one brush with her antennae, she fairly leaped into my hand.

No one can know what goes on inside an insect's microscopic brain, and man often puts thoughts there of which the insect is incapable. So I can not accurately say that Sally was as happy to have me back, as I was to have her. I can only state that, by her reaction, this appeared to be the case.

Many insects deposit their eggs in the ground. The strong ovipositor of the lubber is adapted for digging, or boring, and in this way, eggs are laid below the surface. They are laid in masses, and then coated with a sticky fluid.

Sally laid eggs every two weeks. She was, however, a bachelor girl—since her species is not commonly found around Wichita, Kansas. Sally had been picked up during a field trip to Oklahoma. Whether these eggs will be fertile remains to be seen with the coming season. All have been saved in containers.

As days went from late spring, through summer, and into fall, Sally's food habits changed with the season. In the spring, she naturally ate fresh green leaves, sometimes consuming as much as two large pieces of lettuce. But with fall, her tastes seemed to demand portions of leaves that were dying. Although she still had access to fresh green leaves, she seemed to turn to those plant structures that had no more practical purpose.

Grasshoppers, of course, are costly pests. Out of control, and in numbers they destroy (*continued on page 219*)

JEEP, THE JUNCO

The story of a unique house-guest

By BARBARA M. BENEDICT

Drawings by the Author

WE MET Jeep one stormy night in early November, when the wind was shaking the house with reckless abandon and the radio was giving forth with terse announcements that "storm warnings are posted from Tatoosh to Cape Blanco." Brad was still at the barn, finishing the last milking shift. Waiting supper for him, I sewed in the living room, with all the lights ablaze to illuminate my work. The rain swooshed against the large front window with each rattling gust, and it was indeed "not a fit night for man nor beast!"

Suddenly something hit the windowpane with a jolt. I looked up, but saw nothing. Again the same hard whack, and there was a small, slate-colored junco fluttering at the wet glass. He slid down to the sill and I went to the window, wanting a better look, yet hating to frighten him away. He crouched there on the sill, looking up at me with bright, beady eyes. He was being buffeted by the strong south wind so that his little body literally bounced on his hairpin-skinny legs.

Once more he tried to fly through the window, so I went to the front door and opened it, saying softly, "Are you pretty unhappy out there?" He fluttered up from the sill, made a half-circle and threw himself at the screen door, clinging almost in front of my face. I pushed open the door, stood aside and said, "You'd better come in, little kid." And that he did, without a moment's hesitation, exclaiming "Jeep!" as he went past my head.

The lights were on in the kitchen, dining and living room, and my visitor flew back and forth, probably "casing the joint." He did not take the headlong, panic-stricken flight that captured birds so often show, smashing aimlessly into walls and windows. He lilted in his journey, swooping low through the doorways, hedge-hopping over the furniture and always landing on a well-chosen perch, such as the top of the curtain ruffle, the back of a chair, the kitchen counter, and, which was to be his favorite during his visit, the dried cornstalk arrangement I had in a hickory basket in the kitchen.

Jeep acted like a bird who had got himself into an adventure and was going to make the most of it. He flirted his tail, briskly sharpened his bill on his various perches, and vigorously tugged at the dried corn tassels. He might have been amazed at his own daring, but I knew that he was not too concerned or frightened, for he kept his neat, plump shape. A scared bird gets long and skinny and his crest goes up and down at an alarming rate. I like to think that it was warmth and not fright that made Jeep pant a little when he first came in. The glowing coals in the Franklin stove gave a tropical contrast to the stormy night, and perhaps Jeep felt the

need of running his own air conditioning system until he was acclimated.

The kitchen became Jeep's favorite room; for some reason he loved to hop on the brick-red linoleum floor. It was the only one of the three rooms where he acknowledged the presence of a floor at all. He would first perch on the cornstalks, rustle around a bit, then hop to the basket filled with walnuts, apples and bananas. A few swipes of his bill on the fruit and down he bounced to the edge of the kitchen work shelf. Here



The dried cornstalk arrangement in a hickory basket in the kitchen was a favored roosting place.

he ran into some difficulty; the steel edge-binding gave him no purchase for his wildly clutching claws and his legs slid at opposite directions into a quick split. The only way he could keep his balance was by crow-hopping in gay little dance steps, with half-raised wings for ballast. And finally he would flip himself to the floor, where he became almost lost in the pattern.

During his first few rounds of investigation, Jeep tried to land on the boughs of the pine-needle wallpaper but soon discovered that that got him nowhere in particular. Perhaps that is why he wanted to come in originally; the rooms must have seemed like a lovely, sunlit glade of pine branches. I was beginning to think that Jeep was a pretty smart bird, for he did not keep trying the things that would obviously not work, like the make-believe pine boughs.

While I was in the kitchen fixing the last-minute

supper preparations, Jeep flitted in and out, but spent most of his time in the living room, on chair backs, or hopping the length of the curtain rods behind the ruffles. When I went into the living room to pick up my sewing, he decided that the chandelier was a good vantage point from which to spy on me, and he teetered from one frosted glass chimney to another, head always cocked in my direction. The bright light turned his delicate



In the curtain ruffle.

legs into transparent little toothpicks and highlighted his pearly breast feathers before they met the dark brown of his handsome hood. His outer tailfeathers were stark white, bounding the gray middle feathers.

Soon he went back to the kitchen and settled himself in the cornstalks, head hunched down between his shoulders, his white bill an

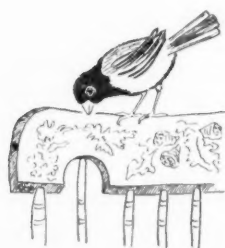
exclamation point in his tiny dark face. I wonder if he knew what a picture he made, perched there in the dried arrangement, with the Grandma Moses wall-hanging as a background, depicting snowy fields and gray farm buildings.

Brad burst through the door in his usual cheery manner and Jeep exploded straight up in the air, recovered and swooped for the sanctuary of the living room curtain ruffles, leaving Brad the impression of a whirl and a blur.

"What. . . ?"

"Walk softly, Mister B. We have an honored guest."

Brad was equally intrigued, and two humans and one small bird spent a cozy evening listening to the radio, while the frustrated wind whined around outside the house. I went back to my sewing after supper, and Jeep nestled down behind the curtain ruffle, sleepily peering at me from time to time. He had completed a thorough ablution, preening each wing feather from base to tip, with an involved inspection of his under-drawers at the end.



Inspecting a chair.

Drowsiness soon overtook the three of us. Hoping our house-guest would sleep in the kitchen, I turned out the living room light, and Jeep obligingly headed for his cornstalks. He scrounged around a bit, trying first one perch and then another, and found one to his liking on the left side, next to the rail fence in the Moses painting.

Brad said he supposed that I was going to leave the

kitchen light on all night, and I said I certainly was; we had done so when Cassidy was a kitten and I was worried that he could not find his sandbox in the dark. I wanted to accord Jeep the same courtesy in case he tumbled from the cornstalks and could not find his way back to bed.

When we tiptoed past Jeep on our way to the bathroom, he was too contented to bother flying anywhere and just placidly swiveled his head to watch the bathrobe parade. Lights out through the rest of the house, we left Jeep to his kitchen boudoir.

Once in the night I awoke as a particularly violent gust of wind shook the open window, and of course could not resist a peek at Jeep. He was just where we had left him, fluffed out into a perfectly round ball, with his head so scrunched down in his neck feathers that there was not a sign of his white beak. He looked for all the world like one of those "real life exhibits" seen at the museums of natural history.

Brad and I knew that Jeep would want to go out in the morning when daylight came, so my alarm was set for that hour. Sure enough, when I went into the living room just as the trees were discernible against the brightening sky, there was Jeep, hopping the length of the window sill, tapping at the glass and stretching his wings. I opened the front door but he was too busy working on the window.



A bookish bird.

He flew around the room once, scolding slightly. "Tk! Tk-tk-tk!" Back to the window and increased flutterings. So I gently put my hand over him; it was like touching the essence of spirit-and-feathers. I carried him out to the front porch and balanced him in my open palm. Our released house-guest sprang from my fingers in one jet-propelled burst, out over the vegetable garden in a buoyant, exhilarated glide, and I caught a last glimpse of saucy white tailfeathers as Jeep skittered into the blackberry vines.

While we were at breakfast, a busy flock of juncos flew into the larch tree, dotting the bare branches like animated music notes—all of them carbon copies of Jeep in apparel and action. Surely he was among them as they pursued each other in friendly acrobatics, racing on to the top of the rail fence and into the twisted honeysuckle vine at the corner garden. One robust fellow stopped for a quick bath in a mud puddle. Was it Jeep? Can you imagine him, as he re-joined the gang, saying—

"Hey, fellas! You'll never guess where I spent the night!"



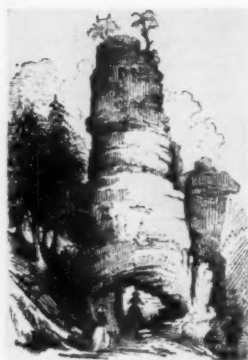
SQUALL

*The flying printers on a cloud's high form
Issue the late edition of the storm.*

Daniel Smythe



The Natural Chimneys rise from the flood plain of Virginia's North River. The tower on the left is more than 100 feet high. Note the cedar tree atop the chimney, as it was in 1857, when it was sketched by David Hunter Strother for *Virginia Illustrated*. Another view below, showing how weathering along vertical joints has separated the towers from the hill behind them.



HIDDEN in a small valley in central-western Virginia are seven tall towers of bare, craggy rock. These towers, called the "Natural Chimneys," rise perpendicularly from the flat flood plain of nearby North River. Although the tallest of the chimneys is more than one hundred feet high, all are so well concealed against the valley wall that they appear to view with surprising suddenness when the visitor arrives at the site.

Nature's Ageless Chimneys

Seen across the broad expanse of green grass at their base, the "chimneys" look so foreign to their surroundings that they seem temporary and unreal. Closer and careful examination reveals dignity and agelessness. In sunlight they glow as if emitting a soft yellow-gray light; in shadow they are like desolate ruins. Away from main highways in the Shenandoah Valley, one mile north of the old village of Mt. Solon and fourteen miles north of Staunton, the chimneys, now privately owned, have attracted visitors for more than a century. Geologists are particularly intrigued by the formations.

Early visitors to the Natural Chimneys wrote interesting accounts, both historically and in speculation about the origin of the chimneys. Geology was just beginning, in the nineteenth century, to evolve from first tentative gropings, and to formulate fundamental concepts and a standard vocabulary. One indication of the growth of geology is shown by the changing ideas and terminology used in explaining how the chimneys were formed.

The earliest record of a visit to what may have been the Natural Chimneys was apparently written about 1750 by Margaret Lewis, wife of the first settler of Augusta County. She mentions a stream, and two later accounts speak of the towers as rising from a stream. Today the nearest stream is more than one hundred yards away. There are few data on the rate of lateral migration of streams, so this is of much interest. In the *Commonplace Book of Margaret Lewis* is this entry: "Last Monday was a holiday and many of the young folks, and their elders, did take repast along in blankets and go up to see the tower rocks, as we call them, a few miles off . . . my daughter went with the young Indian across a branch of the little stream, Lewis Creek. . ."

In the *Southern Literary Messenger* for November, 1834, appears the first article that undoubtedly refers to the Natural Chimneys. The author, G. C., not only described the chimneys but also suggested how they were formed. Today his suggestion seems humorous, but his use of the specialized term "alluvial," and the evident broad scope of his reading, make noteworthy this first attempt to explain the chimneys. G. C. wrote: "The road opened upon a fertile valley, which. . . is the alluvial border of a flowing stream. The strata of limestone hills followed their usual order of parallel lines to the great mountains of our continent, as though a strong current had once swept through this magnificent valley . . . The summits or towers, of which there are seven chimnies, . . . rise almost perpendicularly from the bed of a stream, winding around their base. . . These rocks in their formation resemble the palisades on the Hudson

By C. COLEMAN FISHER

Photographs by the Author

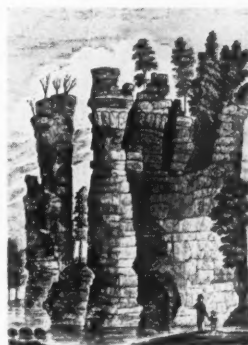
river—but are more regular in their strata. . . . Imagination may indeed conceive that this noble structure was once the Scylla of a narrow strait, connecting the waters of the north and south, until their accumulative pressure burst through the blue ridge at Harper's Ferry, and left in their subsidence these towers, as a perpetual memorial of their former dominion." G. C., then, believed that the towers resulted from one sudden catastrophic flood.

In *Historical Collections of Virginia*, published in 1845, Henry Howe reproduced a rough steel engraving showing the Natural Chimneys projecting above water and quoted at length from G. C.'s article. Howe spoke of the "Cyclopean Towers," as he called them, as being "among the greatest curiosities of nature in the Union."

David Hunter Strother, using the pseudonym Porte Crayon, sketched and wrote about the Natural Chimneys in *Virginia Illustrated*, dated 1857: "This curious group of natural towers rises at the point of a limestone hill, which juts out like a promontory into an extensive alluvial bottom. There are seven of them, their bases washed by a small stream."

William Cullen Bryant, the American poet, was editor of the next publication to mention the towers, *Picturesque America*. In the chapter entitled "Scenes in Virginia," by G. W. Bagby, are two sketches of the Natural Chimneys, neither showing a stream at the base. Bagby, writing in 1872, said: "In Augusta County are the Natural Towers. . . . The Towers rise straight up from the cultivated field. . . . The inner side of the pile is really attached to the hill-side. The colors are varied in horizontal bands, and, from the seams which appear at almost equal intervals in their height, the Towers are apparently the result of successive depositions." Bagby's explanation of the towers illustrates one trend of geologic thought of his time, but it is wrong. The towers were not formed as the rock was laid down but were carved millions of years later by erosion of rock deposited in normal continuous beds.

A sketch of the Natural Chimneys, showing no stream at the base, is reproduced in the 1884 volume of *The Virginias*. Jed. Hotchkiss, the editor, a consulting engineer who made geological and topographical surveys, wrote, in attempting to explain the origin of the chimneys: "This fine group of natural towers . . . is one of a line of somewhat similar objects that form part of a northward facing escarpment of horizontally disposed strata of the great beds of Lower Silurian or Cambrian limestones of the Valley of Virginia. . . . The same forces (probably a glacial flood) that opened a way for this North river through Narrow-back or Little North mountain and eroded for it a plain-like stream valley, have



More of the towers, these cut through with tunnels through which an ancient stream may once have flowed. North River is now 100 yards to the left. The sketch at the left was published in 1845, showing a stream at the base of the towers, the cedars atop them. The horizontal bedding of the rocks preserves the chimney form that is found in these interesting Virginia towers.



carved these curious towers from the solid limestone rocks that here successfully resisted the southward rush of that flood and turned it eastward."

The similarity between the explanation of Hotchkiss and that of G. C., written fifty years earlier, is striking. Hotchkiss, although using more scientific and less picturesque language, also supposed that the towers had been formed by the catastrophic action of a flood, in his

case a glacial flood. It is not clear what he meant by a "glacial flood," but likely he referred to a flood of water from the melting of ice. A melt-water flood of the volume and force that Hotchkiss described does not fit the geologic facts of Virginia as they are known today. If he were referring to a flood of ice, he was extending Ice Age glaciation far south of its actual limits of advance. Still, Hotchkiss' suggestion that the origin of the towers is related to glaciation is an attempt to apply what was then a new concept in geology. When G. C. wrote in 1834, the theory that great parts of the earth had once been covered by glaciers was virtually without proponents and not widely known; even Louis Agassiz, who later became the staunchest advocate of the glacial theory, was a skeptic at this time. In Hotchkiss' day there was still opposition to this concept. Hotchkiss thought that not only the towers but the whole valley of North River had formed in this one flood. This belief that land features are developed literally overnight was widespread in the nineteenth century. Today, most land features are thought to be formed slowly by the persistent action of wind, water, and ice.

Geologically speaking, the Natural Chimneys of Virginia are erosion outliers in Cambrian dolomite. The dolomite is broken up by a series of cracks or joints, and the action of weathering in enlarging these joints has separated the towers from the hill behind them and has also separated individual towers from each other. Most of the joints are vertical, or nearly so, and therefore the tower walls are perpendicular. However, the largest tower leans noticeably and, it seems, precariously toward the others. This is because the joints bounding it are not vertical. North River has done an excellent job of removing debris that has fallen from the chimneys, and this, coupled with the steep angle of the joints, has resulted in an abrupt valley side. The towers themselves

are relatively unbroken by joints, so they are more resistant than the surrounding rock, even though they are no different chemically.

The horizontal strata found at the Natural Chimneys contribute to the preservation of the form because rocks cannot slide or roll down a flat bedding surface. Two factors determine the height of the chimneys: the rate that North River lowers the level of its flood plain, and the rate that the tops of the chimneys are lowered by weathering. In more than thirty years no large pieces are known to have fallen from the towers, which resemble closely the more detailed early sketches, so changes in the chimneys take place slowly. Even some of the cedar trees growing near the tops from bare rock, and looking like Christmas decorations on a penthouse terrace, have not altered much in one hundred years. It is interesting to note that Castle Hill, about one mile away, is still in the beginning stages of chimney development, although it has been known as Castle Hill since at least 1838.

Natural tunnels are completely cut through the bases of two of the towers, and caves and sink-holes abound in the area. These are caused by the action of water beneath the ground in dissolving or mechanically wearing away the rock. The tunnels may once have been parts of the channel of an underground stream and still later have been the dens of animals and a shelter for roving Indians. Today only a few bats and hornets make their winter homes in these natural refuges. The chatter and bustle of tourists in the summer apparently drive these visitors to quieter quarters away from the vicinity of the chimneys.

Some 500 million years ago the rock in the Natural Chimneys was deposited in a Cambrian sea. Now, as a recent episode in its history, it has been carved by erosion and weathering into these ageless chimneys. ❧ ❧ ❧

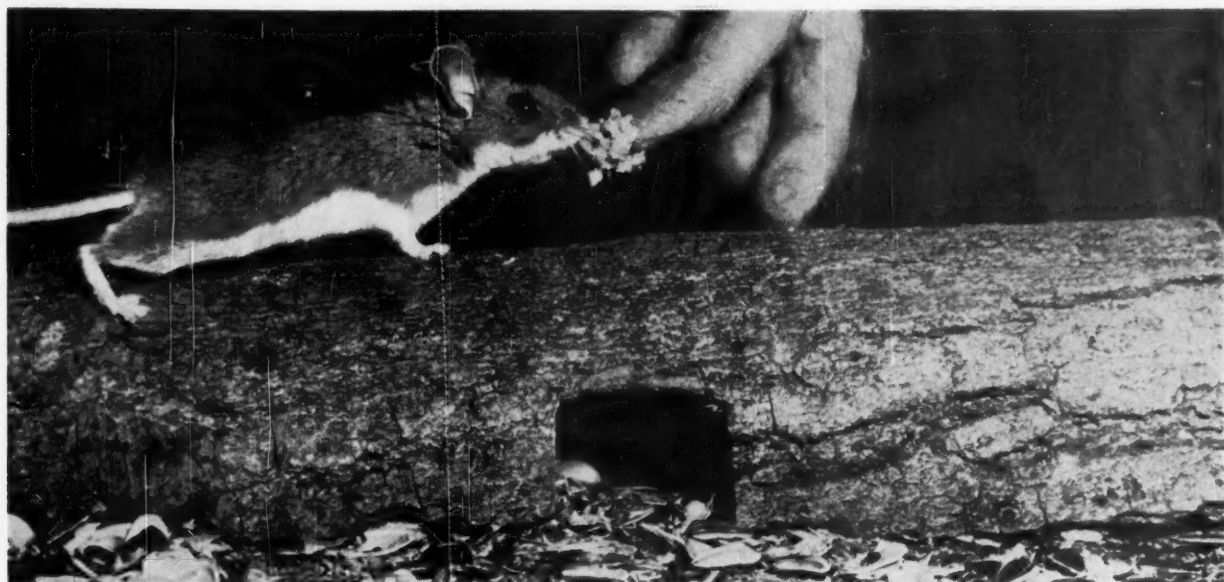
HAVE YOU NOTICED?

*Winter has made a long, long stay;
But spring has a hint on the wind today;
And the man down the road has this to say:
"Have you noticed how bright the willows?"*

*"There isn't a leaf out anywhere;
"The willows themselves are yellow-bare —
"But rosy-like. If you've time to spare
"Just notice how bright the willows.*

*"You think that the winter will never end.
"Yes, cold it's been, and March can send
"Some more of the same! But, tell me friend,
"Have you noticed how bright the willows?"*

Richard F. Armknecht



White-footed mice do not become tame in the sense of developing fellow-feeling for humans. They are ever alert for a way of escape, but they do lose their fear of the sight of man, although sight, except for moving objects, plays a comparatively small part in their lives. Their lightning reaction to quick movement and sharp noises, along with their constant industry in providing food and shelter, enables them to live successfully in a world almost completely hostile to their existence. This mouse is about to take formula from the end of a finger, and is tense in every muscle, ready to move with the speed of light at the slightest sign of danger.

White-footed Mice

By R. J. RUTTER

Photographs by the Author

THE white-footed mouse, or deer mouse, *Peromyscus*, is probably the most widely distributed mammal in North America. It is equally at home in heavy forests, treeless plains, and arid deserts, and ascends our highest mountains as far as vegetation will grow. A familiar visitor to cabins in the remote wilderness, it is just as likely to turn up in a city's suburban garden.

The basic color pattern is some shade of gray or brown above and some shade of white below, but the variations are many. Economically, this mouse is more beneficial

than harmful. It is fond of insects, and, except for some areas in the West, where it is occasionally a real nuisance in grain fields, it causes man little trouble. It will occupy vacant cottages in the woods, and sometimes damages bedding in search of nest material, but it seldom raids the pantry of an occupied house.

The mice pictured here belong to the sub-species *Peromyscus maniculatus gracilis*, which occupies what might be called the northern Great Lakes region. They will thrive on the food formula recommended several times for small mammals by Ernest P. Walker in *Nature Magazine*, and I have substituted ground beef or canned dog food for meal worms when these were not available. I also add cornmeal and chopped almonds to the mixture. As they are next to omnivorous, they will thrive quite well without a prepared formula if supplied with a sufficiently varied diet. They are particularly fond of sunflower

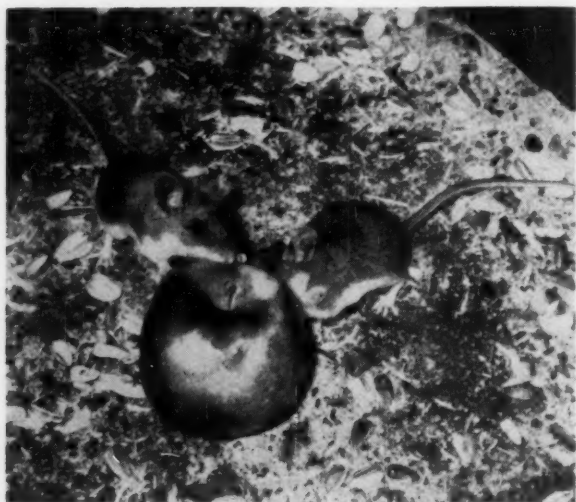
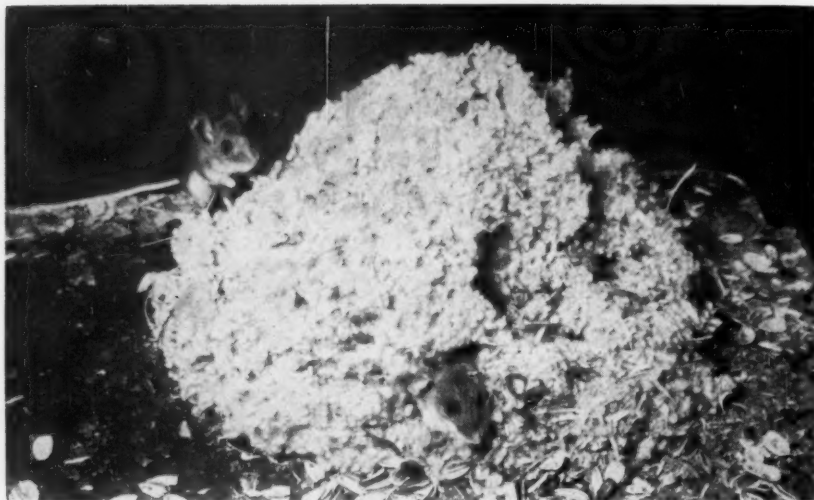


When they are first confined to a cage white-footed mice will seldom drink from an open dish, but will take water from an eye-dropper. They soon learn to use the dish, however, and drink regularly, lapping up the water with the tongue. This suggests that in a wild state they do not normally drink from standing water, possibly relying on dew and rain, or the moisture in certain foods. Experiment has shown that they can exist for at least a week without water with no serious effects, but in confinement they learn to depend on their water dish, and become restless if it is allowed to remain empty too long.



Practical animals, they have never been seen engaging in any activity that could be called play. When a strange object is placed in the cage they show no fear, only cautious curiosity. Once they are assured it is inanimate they try their teeth on it, and if it is inedible or unsuitable as nesting material, they ignore it. It took this mouse some time to discover food in the cup. Notice that it has only two toes of the hind foot on the rim and is holding food in its front feet, yet it is in perfect balance, probably aided by the end of the tail against the log. Although not prehensile, the tail has considerable strength, and it is frequently used as a brace.

This nest is made of absorbent cotton, worked into its present granular appearance by the mice themselves and mixed with some debris from the cage. In the center is a small chamber where they curl up together in a compact ball to sleep. We usually think of a mouse's nest as being built by a female for her young, but both sexes are inveterate nest-builders and when caught in a live trap, as soon as they find they cannot escape, they construct a nest if there is material available. The mouse in the background is standing on its hind legs, a not unusual pose.



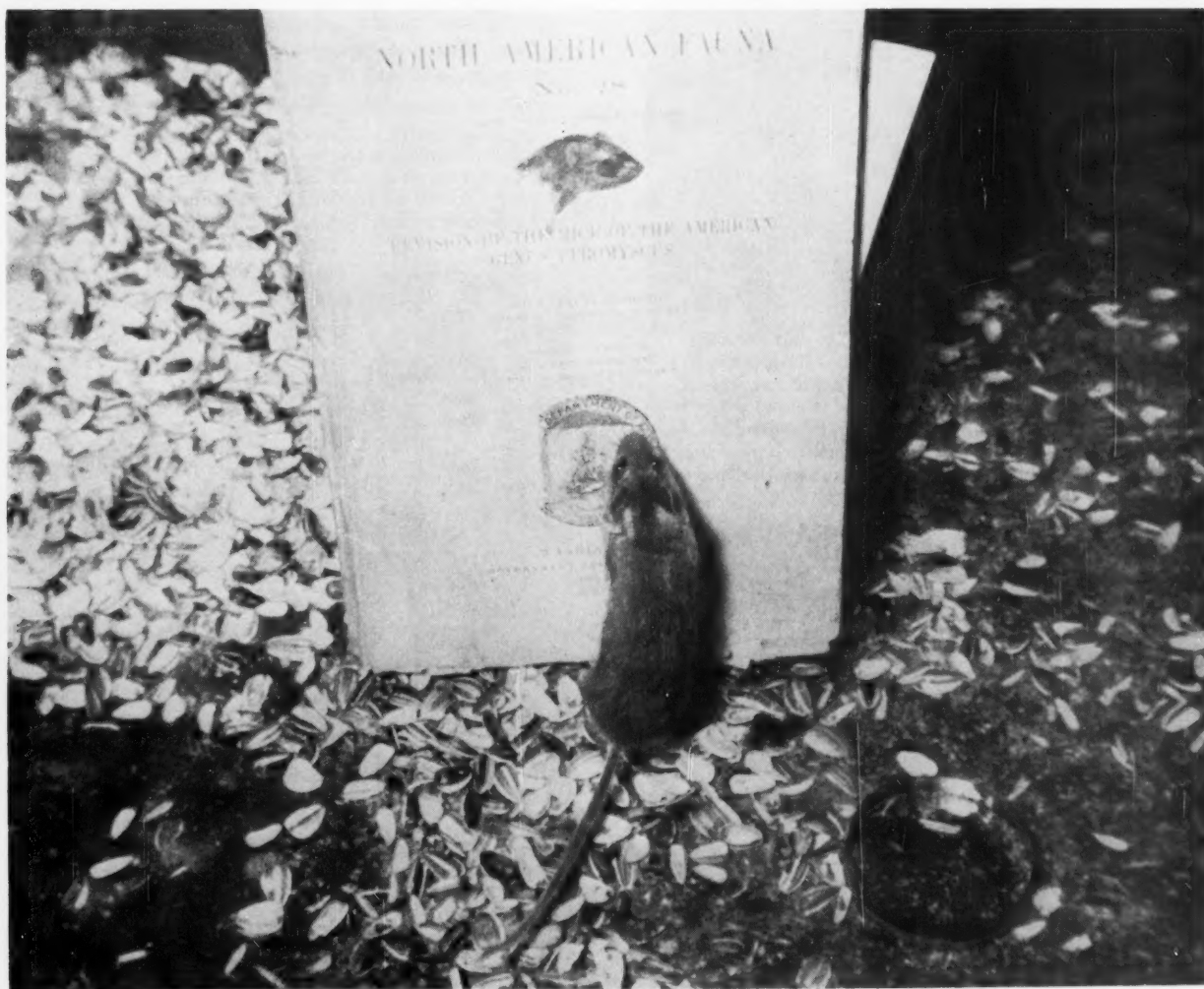
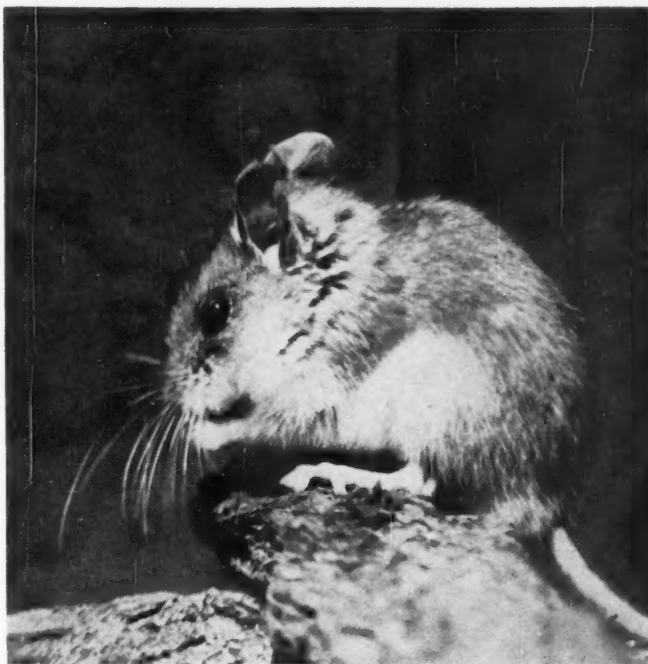
Large items of food are likely to be eaten on the spot, although these mice are quite capable of moving an apple. A full-grown mouse of this species weighs just over an ounce. Although seeds and nuts of various kinds probably constitute their staple diet the year around, white-footed mice are highly insectivorous when opportunity offers. They do not appear actively to hunt live prey, however, and a live grasshopper placed in their cage may remain there for some time before they find it. One of their beneficial activities in a natural state is the destruction of cocoons of various forest pests, such as the larch saw-fly.

White-footed mice make no provision for sanitation, even within the nest, yet they are always immaculate. Among the hundreds I have trapped I have yet to see one with soiled or dishevelled fur, unless it had been subjected to unnatural conditions. This is accomplished by frequent cleaning, performed at lightning speed, and covering the whole mouse from nose to tip of tail. The tail is cleaned by holding it in the forepaws and working over it from end to end with the mouth. After any severe disturbance, such as a fight with another mouse or being handled, the first act is usually a thorough cleaning.

seeds, almonds, raw apple, and bacon, but the traditional mouse food, cheese, is not one of their favorites.

For anyone interested in keeping wild animals in the house they are to be highly recommended as clean, quiet, and entertaining guests. The only requisites are a mouse-proof cage, nest material, and, above all, regularity in providing food and water. 🐭 🐭 🐭

Although reading is not an accomplishment of the whitefoot this one seems keenly interested in the genealogical treatise on its family prepared many years ago by the then Biological Survey of the U.S. Dept. of Agriculture.



Keeping Timber "King"

American Forest Products Industries Photographs



Eager students clambered out of school buses to get going on the planting job. The small block of firs in background will provide some seed for burned area, but Nature needs a helping hand here.



Keep Oregon Green, a campaign in public education, is designed to prevent forest fires. Keep Green slogan has proved to be effective fire prevention tool in timber conscious Oregon. (Below) About 1300 Portland pupils took part in plantings on a Tillamook burn area reserved for them by the State Board of Forestry. It was the fifth year of Portland's big program.



OREGON, where "Timber is King," is teaching her sons and daughters the Tree Farm story. From the Columbia River to the California line, a modern version of Arbor Day takes place each spring as thousands of pupils from scores of schools engage in colorful tree-planting expeditions.

It is the largest single phase of conservation education applied directly in the field with Oregon's up-coming citizens as principals. It aims at encouraging the youngsters to take personal and lasting interest in forests, forest crops, forest protection and wise use.

Working mainly in burns where the red forest enemy laid waste the land, the pupils get an idea of damage done by forest fires and at the same time do their bit towards restoring such lands to productive status.

More than 3000 pupils of grade as well as high schools will take part this spring in planting trees in a dozen counties in western Oregon. School authorities, the State Board of Forestry, numerous forest industries, Boy Scout units, garden clubs, forest protective associations, Keep Oregon Green, Inc., federal land management agencies, 4-H and FFA groups, banks and merchants, state police, county commissioners and a host of other

Badly burned areas in Oregon's coastal counties gave students a good look at the aftermath of forest fire. Buses loaded with school children passed by this point on road to area set aside for their reforestation effort.



groups representing just about everyone cooperate in the work.

On the west side of Tillamook burn, last spring, 410 seventh graders from every school in Tillamook County, plus and including about 90 4-H forestry clubbers, put in 16,000 Douglas fir seedlings. Some 1300 Portland youngsters, in the largest project of its kind in Oregon, took part in plantings elsewhere in the big burn and in Portland's own Forest Park. It was the fifth year of the big Portland school project. More than 5000 boys and girls have helped plant some 300,000 seedlings so far.

In the steep hills of the Valsetz country, 16 rugged high school boys of Toledo and Valsetz were employed week-ends by the C. D. Johnson Lumber Co. (Division of Georgia-Pacific Plywood Co.) to plant 50,000 seedlings in a small area where natural reforesting had been slowed by a fire. This was the 10th year of C. D. Johnson plantings by schoolboy crews on the company's Tree Farms.

About 550 grade school pupils of the lower Umpqua region took part in the "Reedsport Plantings" on Vincent Creek burn near Scottsburg. This was the 10th straight year of plantings there, with expenses shared by Long-Bell Lumber Co., E. K. Wood Lumber Co., Reedsport Lumber Co. and various merchants. A sawmill superintendent, John Skaaluren, has been a leading figure through the years and has become known as "The Pied Piper of Reedsport Tree Planters."

In the Coos Bay area, some 200 pupils of Marshfield and North Bend high schools put in 10,000 seedlings on Beaver Hill county forest under sponsorship of Coos County Keep Oregon Green, Stella A. Cutlip, chairman.

This demonstration planting employed two school children. The boy uses a mattock to open the earth, the girl plants the seedling.



An industrial forester gives some last minute instructions to a group of youngsters before starting them out with bundles of Douglas fir seedlings and planting tools. Logs on ground are grim reminders of what fire can do to trees.



For the past 10 years, school children of Reedsport, Oregon, have had an Arbor Day every spring, going out en masse to plant timber trees. Since 1951 they have devoted efforts to Vincent Creek burn, where 26,000 acres were laid waste by forest fires. This scene, from the 1955 Reedsport planting day, shows group admiring a pine tree planted two years before by boy at right. The tree grew 14 inches.





For about five thousand years an insignificant and feeble insect has been kept working to make clothes for mankind. If it returned to its native forests on the Himalayas it would soon die. It has almost been refined out of existence by domestication and is no longer found anywhere in the wild state. It is protected against heat, cold and disease, and fed by hand. This little caterpillar, the larva of *Bombyx mori*, the mulberry-feeding silkmother, during its brief existence eats more than 4500 times its own initial

weight. Smaller than the head of a pin, the eggs of the silkworm moth are artificially hatched during the season the mulberry leaves are ready for feeding the larva. The worms increase in size so fast that, after the fourth moult—about three weeks after hatching—it has grown to be two inches long. Maturity is reached in 45 days in which stage the caterpillar is a smooth, naked, wrinkled, whitish little fellow sporting a short anal horn. Many races have been produced, larvae and cocoons differing in color.

The Silkworm Story

Photographs and captions

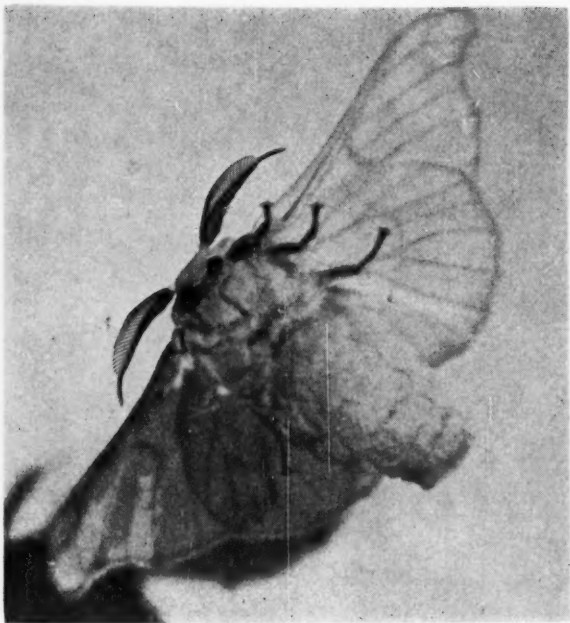
By WILKINS W. WHEATLY

When the larva is full-grown it stops eating and hunts a slightly elevated place to spin its cocoon. In rearing houses brushwood branches are provided. Crowding of positions is avoided to prevent spinning double cocoons by two worms spinning together and so interlacing their threads that they can only be reeled for a coarser and inferior thread. This mature silkworm is about to climb a twig and select a place to start spinning.

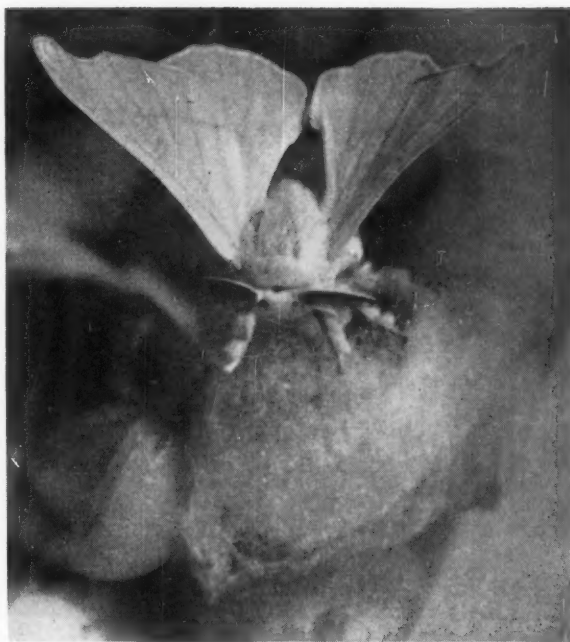


The insects complete their thick, oval, white or yellow silken cocoons, measuring about an inch in length, in from three to four days. For commercial purposes, in two or three days, the cocoons are collected and the pupa killed by throwing the cocoon in boiling water, or by placing it in a hot oven. This prevents the bursting of the shell by a fully developed moth. Then thread, which may be as long as one thousand feet, is unwound.





This photograph was taken through glass and shows the underside of a male moth, as well as the feathery antenna, common to both sexes, with its margins toothed like a comb.



After a lapse of from twelve to fifteen days the moth makes its appearance. It escapes from the cocoon by secreting a chemical solvent that readily dissolves the silk at one end and allows the moth to push through. This male moth has just emerged from its cocoon and will lose no time in seeking a mate. After coupling, the males are thrown away, and the impregnated females placed in a darkened compartment until they have deposited their eggs.

Although in the pupal stage it has fasted for more than two weeks, upon becoming a moth the insect's desire is not for food but for a mate. With wings vibrating rapidly, but with all six feet on the ground, the jaunty little male sets out on the final adventure—a walk that brings him to a waiting female. Neither sex eats any food during the mating period, nor will they ever taste food again. In its adult, winged or perfect form the male silkworm moth is a delicately beautiful object of nature. Its wings are kept constantly elevated and its dark eyes and antenna give it an air of distinction.

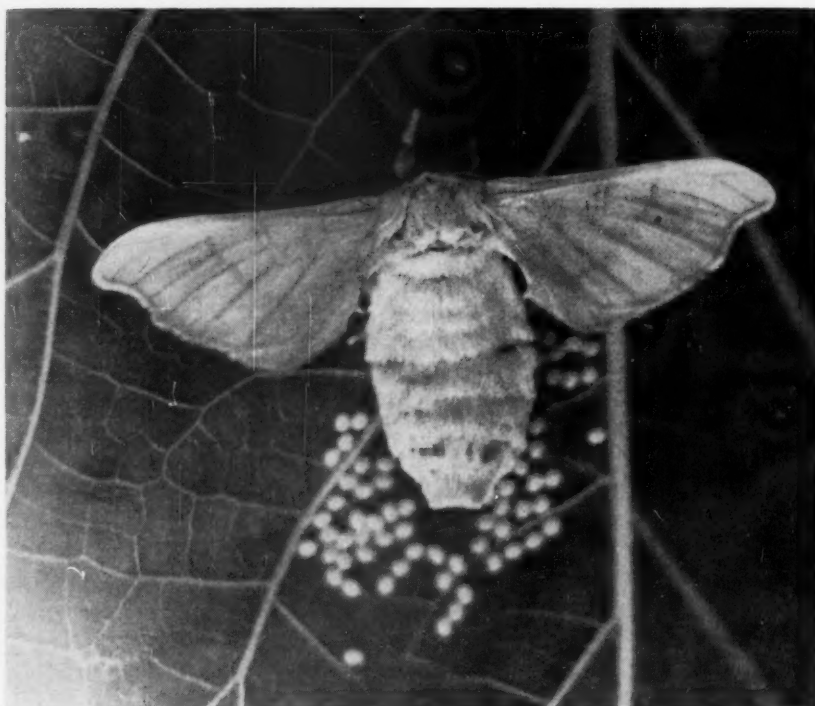




An insect three quarters of an inch long with a wingspread of an inch and a half might well be expected to fly, but the silkworm has been pampered and robbed of its natural strength, with the result that it has lost the power of flight. This is a distinct advantage commercially because the moth remains in uncovered containers, does not roam about when unconfined, and can be easily handled.

The body of this female silkworm moth is much distended because it contains about 300 smooth, yellowish-white eggs, which it has yet to deposit on the mulberry leaf. When her work is finished she will live only a day or two. This operation was photographed in midsummer. The eggs darken as the embryos develop but they will not hatch until next spring.

As now being bred the silkworm possesses all of the qualities necessary for successful domestication. It is definitely useful to mankind, it is now perfectly adapted to unrestrained captivity, it breeds readily, and its young mature rapidly. By careful selection man has developed many races of silkworms that meet the need for variations in color, quantity and quality of the silk to be produced. The Chinese silkworm moths are reported to have produced as much as 100,000,000 pounds of raw silk in a single year.



"Our Daily Poison"

WHEN, in 1945, the insecticide DDT was about to be released for post-war civilian use, we did not join in the almost unanimously extravagant acceptance of the millenium that this chemical was supposed to bring. Instead, in March, 1945, we carried a notable article by Edwin Way Teale, one significant paragraph of which we quote:

"Those who, today, would remold the world nearer to their heart's desire with DDT visualize their paradise as a realm devoid of this insect or that insect. They cherish an old, old illusion. They still imagine—in spite of a thousand bitter lessons to the contrary—that they can pull out threads here and there from the fabric of Nature without otherwise changing the web. If, and where, DDT can be used to combat specific injurious insects alone, it is likely to prove of great benefit to agriculture. But where it is broadcast indiscriminately, cutting a clean swath of insect life, its potentialities for harm are immense. In other words, DDT must always remain a 'rifle' weapon instead of a 'shotgun' weapon. It must be aimed at a specific bullseye in its peacetime use and must never be turned loose on a countryside. Dusting of field or wood from the air will have all the judicious foresight of machine-gunning a throng of friends in order to kill a fleeing bandit."

These were prophetic words, unfortunately not heeded in the years that have followed, and at what cost to relationships of creatures of the wild, one to another, and to human beings we are only just beginning to realize the hard way.

In the same issue of *Nature Magazine*, we quoted, in an editorial, a December, 1944, resolution of the American Society of Economic Entomologists which said:

"DDT will not kill all important insect pests. It will kill many beneficial insects which are allies of mankind against the destructive species. Because of its toxicity to a wide variety of insects, its large-scale use might create problems which do not now exist."

This warning, also, went unheeded, and the creation of new problems of insect control is multiplying daily.

In our editorial we cited the ignorant remark of a professor of biological science to a meeting of science teachers, where he hailed the promise of a fine new world "free of insects." And with respect to the imminent release of DDT we urged:

"Let us, then look objectively and scientifically at this new insect-killer. Let us await the results of careful experiment and research, leaving DDT in the hands of those who know the danger of such poisons until such time as it may be released on a sound and safe basis. And, above all, let us get out of our minds the idea that man wants to—or can—survive in a world 'free of insects'."

Events have proved that we were more confident than we should have been about the restraint of those in

authority and in research, whether because of indifference or the influence of the chemical industry.

More than a decade has elapsed since we sounded these warnings. In the interrim more and more powerful insecticides have been devised, and along with them fungicides and other agricultural chemicals of great potency. In the same interrim, in typical American fashion, we have accepted these poisons, and are still busily doing great violence to the ecology of the outdoors and adding daily to a real menace to human life.

The article that immediately follows this editorial is a case in point. And the title of this editorial is borrowed from the book, *Our Daily Poison* by Leonard Wickenden (Devin-Adair, N.Y., \$3.00), which bears importantly upon the ecological and human impacts of chemical agricultural poisons. We reviewed this book in March, but it is, we feel, of such outstanding significance that it may properly be further cited here.

During the past decade the body of evidence against many of our present practices with regard to the use of chemical agricultural poisons has been building up. Mr. Wickenden presents much of this assembled evidence in a manner that should give us all reason for alarm—and action. His book should be—and we hope will be—read in its entirety; brief quotation cannot do justice to its importance.

From the ecological point of view Mr. Wickenden cites testimony about the spectacular destruction of natural balance in the insect world, along with the growth of immunities among insects, to the end that we require more and more lethal poisons for control. From the point of view of humans, and as an example of human impact of these poisons, he points to the phenomenal increase of hyperkeratosis in cattle along with a coincidental and proportionate alarming rise of hepatitis in humans. Both diseases concern the liver and have amazingly comparable symptoms in man and animal. They are caused by ingestion of chlorinated hydrocarbons, of which DDT is the most widely known.

The roster of deaths from direct contact with these lethal poisons is increasing. Evidence of the retention of DDT in the human system to a point beyond toleration—if there is such a point—is growing. The destruction of essential soil bacteria from the residues of insecticides, fungicides and herbicides is being demonstrated. These poisons are being retained in fruits and vegetables, and, from them, by humans, while we function as guinea pigs to see just how much we can take of DDT and its lethal kin. Doctors are gradually learning the facts, but are thus far largely silent. Economic entomologists know the situation, but are mainly stuck with the official course upon which they have embarked.

It is not too late to have a really unbiased and uninfluenced appraisal of the mess chemical poisons are getting us into—but it is getting later every day. ❀ ❀ ❀



U. S. FOREST SERVICE PHOTOGRAPH

A spray plane makes its run on a spruce budworm control project in the Carson National forest of New Mexico, where large-scale spraying was carried on in 1955.

Is DDT converting some National Forests into—

BIOLOGICAL DESERTS?

asks VERNON BOSTICK

ON JULY 25, 1955 the Department of Agriculture in a news release announced that the U.S. Forest Service was spraying 2¼ million acres of spruce-fir forest with DDT from planes at a cost of more than 2½ million dollars. The release stated: "One pound of DDT mixed with one gallon of fuel oil is sprayed per acre. This light dosage will obtain a thorough kill of budworms, but the spray is not destructive to fish, birds, or wild or domestic animals."

Perhaps not, but if you will check the warning label on any DDT you have around the house you will find that you are advised to remove such pets as canaries and gold fish from the room before spraying for flies or mosquitoes. Of course, in the great outdoors, the effect of DDT may be different than in a closed room. However, I fear that we have too little real knowledge of the effect of wholesale and promiscuous use of DDT and other high-powered insecticides on our wildlife resources.

When DDT was first introduced we expressed the fear that its unregulated use would do violence to Nature's balance. Since then other powerful insecticides have been developed, together with equally strong herbicides and the like. All these have been extensively used with scant knowledge of their side effects, their toxicity to humans and other animals, their long-range significance, and their effects upon the soil. We believe that these chemicals are accepted for their spectacular results but with too little regard for their overall effects. Mr. Bostick's article reports observations that we believe are truly significant.

As a scientifically trained observer, I have observed closely the effects of such spraying on the Carson National Forest in northern New Mexico. What I saw is, I believe, worthy of note. On June 25 I took my wife and boys, by jeep, into the headwaters of El Rito Creek. This remote stream on the Carson National Forest is in the high mountains and offered excellent fly fishing for native cutthroat trout. A good hatch was on and the trouts' voracity was matched only by the mosquitoes, which attacked us in great swarms. We creeled a dozen or so frying-size trout before retreating from the mosquito attack.

Our boys, aged nine and eleven, are just beginning to master the art of fly fishing and kept urging a return trip to El Rito Creek. So, on July 3, well stocked with the best ballyhooed insect repellants, we again jeeped our way in to this remote trout stream.

We parked the jeep in the shade of a clump of tall Engelmann

spruces. We strung up our rods without being molested by flies or mosquitoes. No breeze was blowing. I could not understand it. Then I saw a common blue-bottle fly on its back, buzzing wildly. I knew the Forest Service planes had been there. No need now for bug dope.

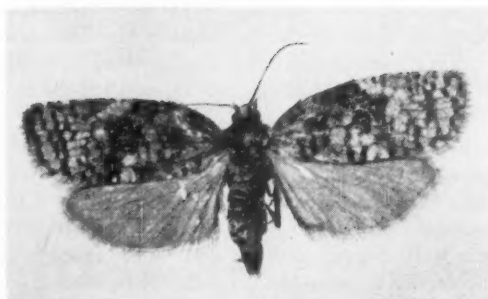
But in the pools there was no action. No trout rose to our flies. I fished only long enough to assure myself that the trout were still there.

They were on the bottom of the deeper pools, resting not feeding. The boys fished up the stream with high hopes. They came back in a couple of hours bitterly disappointed; not a strike on any fly.

About this time a Forest Service jeep came bouncing down along the creek. It was driven by Howard Shupe of the Taos District of the Carson National Forest. He had a number of little cards with him by which he checked the spray pattern. Howard remarked that when he went into El Rito Creek a few days before to put out his cards, there was a trout behind every rock, but, since the spraying, he had not seen any.

"They must all be sick or something. The spray didn't kill 'em for I haven't seen any dead ones either."

I offered to show Howard what was wrong. He went



The moth of the spruce budworm. It is the larval form, however, that is the object of the spraying projects.

with me to a quiet pool. Off the bottom I scooped up a handful of dead insects. I showed him that, wherever the current was still enough to permit them to accumulate, the bottom was covered to a depth of half an inch, or more, with insect bodies. They were of many species, but the pink bodies of stone fly larvae that had crawled out of their pebble cases were most conspicuous. The destruction of fish food was immense and complete.

"They'll come back next year," was Howard's hopeful prediction, when he realized the terrific blow that had been dealt trout fishing.

"From where and from what?" I asked. "I have turned over a hundred rocks and I haven't found a living insect left in this stream!"

Whether the trout in El Rito were too gorged on poisoned insects, or too sick to take our offerings, made no difference. We did not want any if we could catch them. We pulled out for the upper Vallecitos River where we found the fly fishing excellent.

But at dawn on July 5 the Forest Service spray planes droned over the Vallecitos watershed. At 7 A.M. I watched the wild antics of a water boatman in the death throes of DDT. Stone fly larvae struggled out of

A scene in the Carson National Forest of New Mexico, looking up Red River Canyon to Wheeler Peak from Red River Pass Road.

U. S. FOREST SERVICE PHOTOGRAPH



their cases and drifted down stream. Two days later we counted thirteen dead trout along the shores of the Vallecitos River. It is more likely that these trout died from eating poisoned insects rather than from any direct effect of the spray.

The destruction of insect life in the forest was almost as complete as the destruction of aquatic insect life. Not a single mosquito or blue-bottle fly could be seen. Spruce budworm larvae were still struggling at the ends of their webs. For them the forests were sprayed, and they seemed the last of all insects to succumb.

The Forest Service claimed a 93 percent kill on budworms. Their success on other insects, except ants and bark beetles, seemed even higher. It was a thorough job. Every leaf of every plant on the forest floor seemed speckled with brown spots where the droplets of fuel oil had landed. By mid-September an occasional fly was seen. I never saw a mosquito in the areas sprayed during the entire summer. It is hard to imagine such vast acreage so completely devoid of insect life.

With no insects, what would become of our insectivorous birds? Adult birds could migrate, but how could they raise their broods? And what of our game birds? Grouse and turkey populations seem to correlate with the abundance of forest insects.

During the 30s, when tent caterpillars were epidemic on aspen, grouse and turkey were abundant. Their numbers dwindled sharply when the insect infestation petered out. For the past several years, insect populations had been building up, and grouse and turkeys were staging a comeback.

I saw quite a few grouse during the remainder of the summer—as many as half a dozen in a single day—but always adults. I saw only one brood of young grouse during the entire summer. I saw broods of young turkeys, but always in the pine and oak type, which had not been sprayed with DDT. The Game Commission saw fit drastically to curtail the areas open to turkey hunting.

On July 5 I telephoned New Mexico's Conservation Director, a friend of old, and reported the destruction of aquatic insect life on El Rito Creek. On July 10 I again called this matter to the attention of authorities. On August 3 our conservation agencies examined these streams. On September 30 I received their report. The report attempted to gloze over the loss by stating: "The bottom samples examined varied in composition and it is difficult to tell whether any loss had occurred due to the spraying because no checks were made previous to the spraying." The report stated that the food supply was adequate and that the trout were in good condition.

Before the sprayings five to ten, or more, insect larvae of several species could be found crawling around on the under side of any rock you picked up from the bottom of either El Rito Creek or the Vallecitos River. After the

sprayings I have picked up as many as fifty rocks from both of these streams without finding a single insect. Similar streams draining private lands, not sprayed with DDT, still had the usual half-dozen or so larvae per rock.

Dahl Kirkpatrick of the Forest Service stated that areas they had sprayed with DDT were free of mosquitoes for several years. It seems strange to me that the Forest Service will freely admit its complete success in killing mosquito larvae and then pretend that other aquatic larvae are not harmed. I found all larvae killed, from the tiniest midges to huge, three-inch-long, willow-fly nymphs. It was a thorough job.

After reading the report on the examination of El Rito Creek, I again cornered Howard Shupe. Since he was an eye witness to the enormous destruction of fish food, I asked him if this pretending it had not occurred, did not border on the ridiculous. Loyal to official policy, he said: "It looks like we have to decide which

we want most, trees or fish food."

If this were true, there might be some justification for converting our high mountain forests into biological deserts. Unfortunately, spraying appears to have preceded research and there seems to be no important evidence that spraying for spruce budworm is a good forestry practice.

Spruce budworm, although it is found on spruce trees, also feeds extensively on white fir. And white fir is an inferior timber species. The forestry problem in the management of mixed conifer stands is to encourage the much more valuable Douglas fir and prevent the stand from being taken over by the more aggressive but much less desirable white fir. Since spruce budworm prefers white fir to Douglas fir, it may be more of an ally than an enemy in the practice of scientific forestry and ecology in the forest.

Nor can it be shown clearly that controlling spruce budworm is beneficial in the overall conservation of other forest resources. Most of the "damage" done by spruce budworm in the area with which I am familiar (New Mexico and Arizona) is confined to white fir saplings. These thickets of young white firs are over-dense anyway, and the budworm was performing a beneficial thinning.

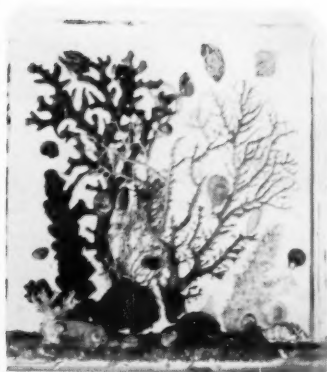
Too dense from a forestry angle, thinning out white fir would give the more valuable Douglas fir seedlings and saplings a chance to grow. These dense stands of white fir undergrowth impede the harvesting of mature timber. They intercept snowfall and waste precious moisture. They use water that might otherwise feed springs and result in increased stream flow. And last, but perhaps not least, these useless white fir thickets shade out useful forage plants of value to both wildlife and livestock.

Aside from the harmful side effects, it may be questioned whether the spending of (continued on page 219)

ALMANAC FOR APRIL

*The sun has crossed the equatorial plane,
Astronomers insist it's Spring again;
But I declare their findings hocus-pocus—
I haven't seen one robin, or a crocus.*

Velma Fehling



Research and experiment make
it possible to—

Preserve in Plastic

By EARNEST L. LUTZ, SR.

Photographs by Ellis Rich

TO GATHER and to keep has been and still is a driving incentive in every field of natural science. The ceaseless search for better and more attractive methods of preserving and displaying specimens found in Nature is still with us. Nature itself established a goal in the long ago when resin, dripping from *Pinus succinifer* along the shores of the Baltic Sea, encased insects and other biological materials in a clear, sticky, golden-yellow substance that fossilized into amber. These captives have been preserved until our time.

Naturalists turned to modern plastics to accomplish and extend such enduring methods of preservation. Acrylics, such as "Lucite" and "Plexiglas," were the first to make possible the preservation of beautiful specimens in a crystal clear medium. But, unfortunately, these resins were dangerously inflammable, their fumes poisonous and they required a complicated preparation and hardening procedure. Consequently they found limited acceptance among hobbyists and the natural

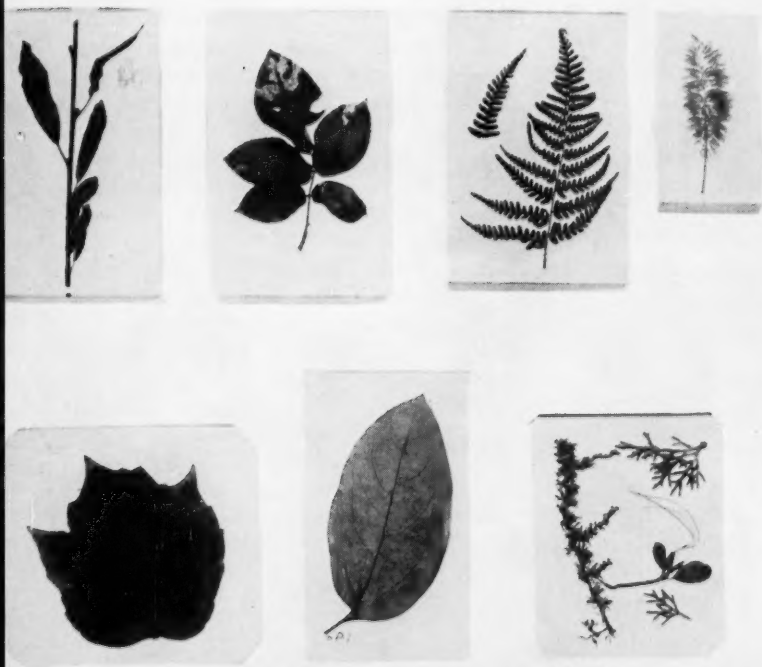
science departments of high schools and colleges.

Unsaturated polyester resins afforded possibilities and naturalists turned to them shortly after their introduction about 1946. There are many of these resins available today, but they have not been especially designed for block casting, and when applied to such use often result in disappointments and complete loss of specimens. So they, too, have been little used.

In 1952 a new survey of the plastics available for casting was made by the Pathology Department of the College of Medical Evangelists, School of Medicine, at Loma Linda, California. The goal was to find a resin, or resin combination, that would give consistently satisfactory results when embedding anatomical specimens in clear plastic blocks. More than two hundred experiments with unsaturated polyester resins, in combination with catalysts and promoters, were made and a formula was finally discovered that meets every casting need. It was called C.M.E.-D6.

This has many advantages over any other formula, and it can be used with equipment found in any home or school. A wide range of specimens can be preserved in this brilliant, transparent plastic at room temperature and without the use of special ovens, hot water baths, or other special curing or hardening equipment.

After a reliable casting medium was discovered a second step concerned the preparation of specimens for mounting. These vary widely in structure and other characteristics, of course, and each group requires specific preparation. My search was to find simple methods for doing this part of the work, and good progress has



Specimens of plant life including leaves, grasses and ferns. The two at the top left are diseased plants. Rose mosaic is plainly evident in the rose leaf.

This group illustrates the possibility of embedding zoological specimens. These require more detailed preparation for embedding.

been made.

The hobbyist will find a large group of naturally dry or easily dried objects, such as coins, shells, stones and similar non-porous specimens, that require no preparation other than cleaning. Such items are good ones for the beginner to try.

Professor Randolph Specht made an extensive study of dehydrating flowers and preserving their natural colors. Flowers prepared by the methods described in his report, "Preservation of Color and Shape of Flowers," retain the preserved color when embedded in plastic. The embedding is more easily done when formula C.M.E.-D6 is used. A beginning should be made with small flowers and then larger ones like roses, orchids, and hibiscus. Small ferns or other appropriate green leaves can be incorporated to embellish the casting. Dr. Specht's book can be secured from the College of Engineering, University of Florida, Gainesville, Florida, for one dollar.

The discovery of a simple method of dehydrating and preserving the green color of plants and the beauty of autumn leaves marked an advance in the embedding technique. Drying them, bedded in a mixture of equal parts of dried table salt and activated silica gel, preserved both color and shape. These qualities are retained when embedded in the new plastic. Some grasses are successfully prepared in a tightly sealed, dark-colored jar with calcium chloride. However, the general plan is to bury all green specimens with a covering of at least one inch of the silica gel and salt mixture.

Possibly nothing can be more satisfying to the hobbyist and collector than to arrange a group of related specimens, or create a simulated garden in sizable blocks of clear plastic. Large ones can be used for book ends, artistic table pieces, or made into the

An exhibit of flowers. A pink rose, red double hibiscus and an orchid form the left end of the top row. A small blue violet nestles in the center. Cholla cactus, Douglas fir and an ear of squaw corn along with other lesser items are shown. All have retained natural color.



base for a lamp. One such arrangement is shown. This larger one shows varied forms of ocean life. A simulated sea floor of sand, rocks, shells, barnacles and a starfish was laid down. Rising from this base are seven varieties of coral. Many shells appear to be floating in the water and near the top two tiny sea horses swim before the large frond of coral. This block measures 6" x 6 1/2" x 3". A thin layer of green-tinted plastic on the back of this block gives a realistic sea-green effect without in any way detracting from the beautiful color of the embedded materials. This casting heads this article.

The variety of uses for an easily managed casting resin makes a long list. Items of sentimental value can be mounted for paper weights. An ever lengthening list of biological objects can be permanently preserved. Sizable, flawless castings can be made and cut or machined on a lathe to make beautiful art pieces. Tints and pigments can be incorporated to make transparent, jewel-like pieces, or shiny opaque ones. In the classroom the application of a controlled unsaturated polyester resin



suggests new uses in every branch of natural science and manual training.

A question often asked by those who have had a little experience with embedding plastics is: "How do you get the bubbles out." This has been a troublesome problem. The controls made possible by the new formula have so lessened this difficulty as to make it of little concern. The few trapped air bubbles can be brushed

free with a small nylon brush and swept away to the edge of the mold.

Embedding in plastics is still an infant science and much is still to be learned. Long strides have been taken in making it useful to the hobbyist, the scientist, and to schools. There is much to enjoy now but more surprises are in store for the adventurous ones willing to experiment.



APRIL IS A WITCHERY

Ethel Jacobson

*April is a golden girl,
Arbutus in her hair.
April is a witchery,
April is a snare.
You may be a sober soul,
Deaf to wanton laughter,
Till she saunters by your door,
And you stumble after —*

*Racing headlong over bog,
Brambled bill and hollow —
Then she vanishes in mist
Where you cannot follow,
Just a mocking echo slung
On the tremulous air.
April is a witchery,
April is a snare!*

Bottomless Lakes State Park

By NELL MURBARGER

HIDDEN away in the dry, rolling hills between the languid Pecos River and the historic Staked Plains country of eastern New Mexico, lies Bottomless Lakes State Park, a public recreational area centered about a strange natural wonder.

Cupped, each in its own sandstone pocket, at the base of a low mesa, the six lakes included in the park range in size from Inkwell, a tiny, deep blue pool, to lovely Lea Lake, with a surface area of 2500 acres. Other members of the group bear the names Pasture, Cottonwood, Mirror and Figure Eight, but individual identities are generally submerged in the collective designation bestowed by an imaginative group of cowboys in pioneer times. When several lariats knotted together and lowered into the water apparently failed to touch bottom, the name Bottomless Lakes had been first applied. Later, it was learned that the ropes' failure to come to rest had been due to the swirling action of the water's strong underground inflow. Although the so-called "bottomless" pools are now known to range in depth from 45 to 600 feet, the early name is still used.

At Lea Lake has been developed a choice recreational area, with tamarisk-shaded camping sites, picnicking tables and fireplaces, and facilities for swimming, boating, and bass fishing. To travelers on U.S. 380, three miles to the north, and to residents of the nearby small city of Roswell, the pleasantly cool park is especially popular on summer days when temperatures are sent soaring by the ambitious sun of this otherwise arid land.



PHOTOGRAPH BY THE AUTHOR

Deep, clear, and intensely dark blue, the lakes of Bottomless Lakes State Park, New Mexico, form an interesting and pleasant oasis in an otherwise arid land.



*Recreation, education and
excitement are found in a*

Nature Treasure Hunt

By ALDEN S. WOOD

Only those Wantonoits who have worked long and hard at their Nature studies will ever see their names listed on this, the Treasure Hunt Trophy. First place winners, exclusively, have names engraved hereon. The official emblem of the Piedmont Center's Wantonoit Club is presided over here by a pigeon hawk.

WHAT words hold the charm necessary to capture the capricious attention of a child, and lure him away from a book, or an apple, or a frog? A story? Maybe. Candy? Perhaps. A treasure hunt? Always!

Nothing intrigues youngsters more than the magical word "treasure!" Whether it be buried on a secret island, locked in the sandy hold of a sunken galleon, or in a tobacco can tucked into a hollow tree, to a child, a treasure is truly a wonderful thing.

Leon H. Bascom is director of the Piedmont Center Branch of the Worcester Natural History Museum. This Bay State institution is a junior museum for youngsters aged three to sixteen inclusive. There Mr. Bascom has found that *Nature* treasure hunts have been instrumental in arousing enthusiasm and desire for knowledge among his young folks.

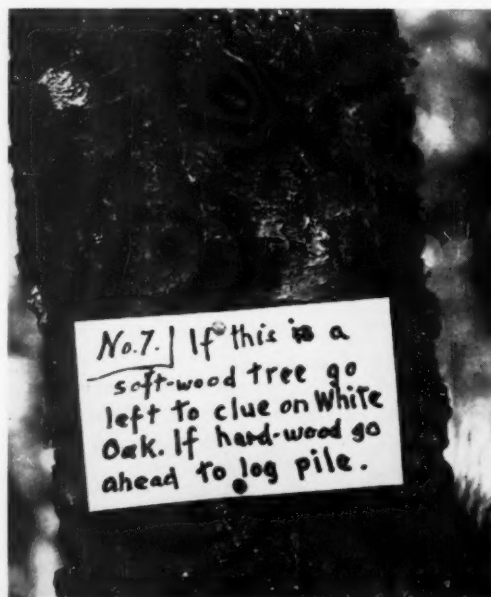
At the Piedmont Center, the Nature treasure hunt plan was started in 1950 by the director and his associates. They recognized this plan as one that would stimulate a healthy competitive spirit, get city children out into fresh country air, and have as a pre-requisite a respectable amount of knowledge concerning Nature. Only those children who belong to the Wantonoit Club (not an Indian name, but a clever title, when given a second look) are permitted to join in the hunt. The Wantonoits, an advanced study group, are in the nine to sixteen age bracket, and represent one of several age-graded clubs within the Center. To become a Wantonoit, a child must have learned to identify successfully no less than one hundred natural objects.

The site where the hunt is to take place is chosen largely at the discretion of the person in charge and may be a wildlife reserve, State forest, or even a privately owned estate with a sympathetic owner. Cook's Canyon in Barre, Massachusetts, exemplifies the type of area ideally suited to a treasure hunt. Therein are found

ferns, shrubs, asters, bottle and closed gentians and many late summer flowers, hardwood and softwood trees, streams, sedges, rushes, granitic and other rock outcroppings. Nearly any place can be scouted ahead for a diversity of flora and fauna, or information may be obtained from State sources.

Before laying out his trail, the supervisor personally checks the area in the interests of safety. He inspects for wells, mine shafts, cliffs, deep or swift-running water, poison ivy or other poisonous plants, caves, overly steep trails, and any other hazardous spot where a hard-running youngster might injure himself. On the actual hunt, the leader carries a suitable first-aid kit, and also

Index cards like this one, as well as shipping tags, make excellent "clues." Clear printing or block lettering is easiest to read. India ink remains fast, even in rain or heavy dew.



warns his charges about drinking from brooks or sampling unknown berries or mushrooms. He might suggest that the children wear sneakers and "old" clothing.

When laying out the trail, which Mr. Bascom advises doing one day in advance, the supervisor must give some thought to those in his group who are city-raised children and may not know up-stream from down. An hour or so for preliminary study of basic Nature lore would not give them an unfair advantage when the hunt begins. Given a well-qualified group, the supervisor can set up a course that will make his students utilize every scrap of outdoor and classroom knowledge they possess.

The objects to be identified along the trail are usually spaced about fifty yards apart and bear ordinary shipping tags on which are printed the clues leading to the next problem. Any sort of natural object may be employed—trees, shrubs, leaves, minerals, flowers, ferns and rocks, for example. An ingenious director can make up some problems of his own, as did Mr. Bascom. He has used bird's nests, fossils, artifacts, trail signs, various animal tracks in plaster casts, mounted birds and mammals. Mr. Bascom usually puts out twelve to fifteen problems along a trail roughly a half-mile to a mile in length.

Partly to keep an extra eye on the youngsters, and partly to add still more incentive, "trading posts," attended by volunteer adults, are located strategically along the trail. The post may consist of nothing more than a cardboard box "table" and a camp stool. Each time a child properly identifies an object, the directions will send him to one of these posts, which the director has stocked with mineral specimens. The trader instructs him to go and pick up some natural object, such as a pine cone or leaf of sweetfern that can be found in the immediate vicinity. Upon making the correct selection, the hunter may pick out any one of the minerals and keep it for his own personal collection. Paper or cloth bags to hold these are carried by the children. Having chosen his mineral, the child is told which way to go to find the next clue, nothing more.

At the actual start of the hunt, the youngsters leave the starting line singly at two-minute intervals with each one's time being recorded by an adult timekeeper, using a stop-watch or a watch with a sweep second-hand. The only help given are the words, "Your first clue is on a tree down that trail," and from there on, the treasure hunter is on his own.

He trots down the narrow pathway and shortly spots a white tag tacked to a tree. Block lettered clearly are the words, "If this is a red maple, turn right to the big oak; if a rock maple, find trail left uphill through the pines."

If he turns right, he will come to the big oak, but the tag thereon will read, "Wrong, it's a rock maple." So the child may lose a full minute scooting back and finding the right trail.

Following the uphill trail, he comes upon trading post #1, set in a grove of spruces, hemlocks and pines. The adult volunteer explains that, upon receipt of a *pine* cone, he will allow the child to select any one mineral on the table. After the youngster has shown he knows



Two Wantonoits try to decide the sex of a stuffed pheasant. The legend asks: "If this is a male bird follow the direction of its beak; If a female let its tail point your way." Which way would you have gone?

his cones, the trader points out the direction of the second clue and our eager hunter sprints away.

This next one may read, "If this is a hickory, go right along fence; if an ash, take the left trail." If he remembers his hardwoods, he will pull into trading post #2 in a few seconds. Here, the medium of exchange is a tuft of needles from a red pine, and since the post is set up in a grove of white, red and yellow pine, he will have to recall how many needles are in the red pine tuft.

Choosing a mineral, he follows the trader's extended finger again.

Now the going gets a bit harder. Our hunter comes upon a big staghorn sumac shrub bearing this card: "If this is sumac, follow the cart road; if it is locust, take the next trail left." The similarity of the compound leaves makes the youngster stop and think carefully. Before the hunt is over, he may come upon a seedling white birch tagged: "If this is gray birch, climb hill left to big stump; if white birch, watch for narrow trail on right." Several youngsters may forget that *seedling* white birches do not have white bark. Still another interesting problem may be to require the children to identify a stuffed pheasant as male or female, then follow the path indicated by its beak or tail.

After having picked his mineral at the last trading post, the child is told to head down-trail and watch for the treasure box. When he finds it, a sign says he may pick out and keep one of the many packets of colored bird pictures inside. A second tag announces: "The finish line is 50 yards down the trail around the bend," and off goes the panting treasure hunter in a cloud of pine needles.

As each child crosses the finish line, he is given free a bottle of soda pop and his time is recorded by an adult whose watch is synchronized with the starter's. To save time, the winners are not announced until after the group has re-assembled and bussed back to the Center in Worcester. Mr. Bascom allows twenty-five prizes in all. Relatively outstanding prizes, such (continued on page 219)

Conservation— John Wheeler's Way

By CARSTEN AHRENS

JOHN WHEELER is really doing something about the conservation of our natural resources. He is more than vocally interested in the wise use and management of our soil, water, minerals, forests, and wildlife. Yet he is not the owner of a farm or a forest. In fact, he lives in a large city, high up in an apartment above concrete-covered earth. The only soil he knows is a tiny rectangle of overly trimmed, fertilized, and mowed vegetation that is the apartment's lawn. John is not rich. He cannot work, and his pension is so small that he has to practice mathematical miracles to make it reach from one month to the next.

If you knew John Wheeler only slightly, you would raise your eyebrows in surprise. How, you would wonder, could he aid conservation. He has been paralyzed for the past ten years and confined to his bed or wheel chair!

However, Mr. Wheeler has the conviction that if conservation is ever to become a way of life it will have to be subtly but deliberately taught. It is not something that all parents automatically pass on to their children. The best conservation-minded public official can not lead unless the public is with him. The public cannot follow unless it is educated. So, Wheeler thinks, the school teacher is the logical one to instill in the young the necessity of conservation. Every teacher, no matter what he or she teaches, should be a teacher of conservation, he says, even if it is only the wise use of school supplies or electricity. Somehow or other teachers must get across the idea that the natural resources, source of America's prosperity and power, are not inexhaustible.

John Wheeler found that the State university offered teachers a three-week conservation workshop each summer. He sent for their prospectus and learned that the workshop was set up in a big fraternity house on the campus where the teachers lived and studied. A bus was chartered to take the student-teachers on field trips to quarries, mines, coal-stripping operations, paper mills, State parks and forests, fish hatcheries, and such. They visited hilly farms that the owners had cultivated in the old, wasteful, up-the-hill, down-the-hill way. They visited, for contrast, farms where strip cropping and contour farming were saving the topsoil.

John Wheeler decided to save seven dollars from each monthly check. In a year he would have the eighty-four dollars necessary to pay the board-room-tuition cost necessary for one teacher to take the three-week workshop.

Since he did not know a teacher, he sent his check to



A Pennsylvania State College Conservation Workshop student dons a helmet before going down into a mine. This is not the teacher in this article but she was thus clad.

the university asking that, if possible, a sixth grade teacher be selected. Sixth grade children, he believes, are at just the right age for conservation education to be meaningful.

Wheeler's check has been received by the university for four consecutive summers. Other years, at the end of each workshop, the sponsored teacher wrote him a more or less formal thank-you note. Last year the university selected Mrs. George Struthers, a most grateful sixth grade teacher. From her John Wheeler received fifteen post cards, each written at the end of a busy day.

Here are samples:

July 9. Breakfast, 7:15. From 8:00 to 12:00 with two 10-minute breaks we listened to a geologist who discussed his science, using maps, charts, etc. After lunch we went on an all-afternoon field trip. Now I can define a syncline and know how they actually look. After dinner we saw three movies on geology and a film strip to summarize everything.

July 12. Up betimes this A.M. for we were to be gone all day on a field trip that took us to several farms. They had been bought cheap because they were so run down and gullied. The three owners had called upon the U.S. Soil Conservation Service which gave free advice and encouragement. Contour farming, strip cropping, crop rotation, fertilizer had changed the pathetic fields to multi-green bands that were really beautiful. One farmer showed us where a gully had been. With nature's help the gully was filled until now the land was higher than it originally was! It's very encouraging.

July 16. An all day field trip gave us a morning in coal-

stripping country. We met one mass of machinery that resembled a prehistoric monster that took a mountain at a mouthful. Some companies level the land after the coal is removed. Others leave un-grand canyons full of evil-smelling, unsightly water. In the afternoon we donned miners' caps, belts, and lamps and went down into a coal mine. I decided (and the instructor didn't agree with me) that these were no occupations for human beings. I'll be glad when atomic power is commonplace. *July 22.* Our last day. I've made a long journey in three weeks. Water used to be a liquid useful in making coffee. Soil: mud carried in by careless pupils; coal:

fuel; trees: landscaping material; wildlife: annoyances at picnics or early in the morning. That's all past. Now I have some idea how all of them are vitally tied up with human welfare and my pupils will too. I know . . . after I get rested again. . . I'll be everlastingly grateful to you for making this workshop possible for me."

John Wheeler chuckled as I returned the cards. "There is going to be a roomful of conservation-minded youngsters in Mrs. George Struthers' sixth grade class this year. Can you imagine any other way that seven dollars a month could do so much good?"

John Wheeler is, indeed, a practical conservationist.

LOST SONG

*A robin was learning a song this morning,
A new one for him, with a dream of a note. . .
The sound of it haunted him over and over,
The golden bars stumbled and stuck in his throat.
And I never knew how the song came out,
For the clouds, even then, were hurrying by,
And the road and the walks were all dappled with rain,
And the song was rolled under by thunder on high.*

Allen E. Woodall

Wearer of Many Disguises

By RALPH J. DONAHUE

IN THE "check and balance" system of Nature, where one group of beings works to keep another from getting out of hand, we find evidence of a high degree of camouflage. Crab spiders are experts in this art. These creatures not only have shapes that permit for quick scuttling, but wear colors to match the flowers in which they elect to secrete themselves. Some of these spiders are of the yellow-green of flower bracts; some are of the gold found in sunflowers, or in the dust of the goldenrod. Still others wear the purple hues of asters and autumn thistles; or, such as *Misumenoides aleatorius*, here pictured on a fading zinnia, assume the color of cream with a purplish quality, and body decorations the color of old wine.

This camouflage has a double purpose for crab spiders. It not only gives the creatures a chance to pounce upon unsuspecting nectar-hunting or pollen-seeking insects at close range, but makes for skillful concealment from enemies, such as the hunting wasps.

However, this "protective coloration," as some have termed it, does not always protect. Open a newly sealed cell of a hair-waisted, or muddauber wasp, and the chances are that at least a third of the spider provender supplied the young wasp will be paralyzed crab spiders of various hues stored away in the larder.



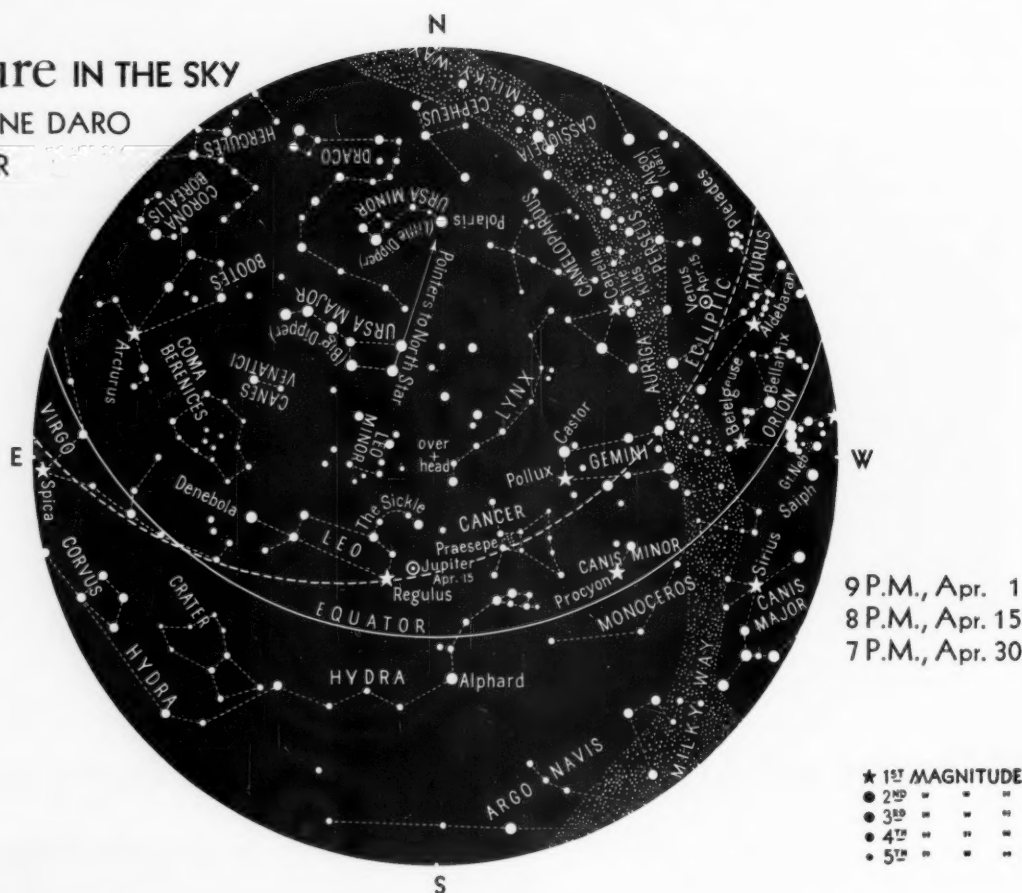
PHOTOGRAPH BY THE AUTHOR

Incidentally, the crab spider pictured on the zinnia, was unco-operative, and kept slipping out of sight between the petals before I could snap the shutter. I finally prodded it out with a straw in one hand, while I operated the camera with the other.



Nature IN THE SKY

By SIMONE DARO
GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the

map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

The Zodiacal Light

"IN FEBRUARY and for a little before, and a little after that month about 6 in the evening, when the Twilight hath almost deserted the horizon you shall see a plainly discernable way of the Twilight striking up toward the Plejades and seeming almost to touch them." So wrote J. Childrey, an English vicar, in *Britannia Baconica* published in 1661.

What Childrey described has nothing whatever to do with twilight, regardless of his—and his contemporaries'—opinion on the subject. The phenomenon is called *zodiacal light*. Until the nineteenth century it was believed to be of atmospheric origin. Modern investigations have shown, on the contrary, that it is extra-terrestrial and arises in the solar system.

Keen eyes and a clear moonless night, far from city lights, are essential if you wish to observe it. Shortly after twilight a faint pyramid of light may appear on

the western horizon, extending along the ecliptic—that is, the zodiacal belt—and getting gradually fainter as the distance from the sun increases. The apparent brightness is comparable to that of the Milky Way. It may be seen also in the east, shortly before dawn. Actually, a few observers with acute vision have been able to trace it all the way across the sky, but we only have their word for it, as most of the glow is too faint to be photographed.

To an observer with average vision the zodiacal light appears, in general, in the shape of a cone or pyramid. The base of this pyramid extends along the western horizon about twenty degrees on either side of the point where the sun has set. The pyramid itself, when seen right after twilight, may stretch along the zodiac upwards of forty-five degrees, or half-way to the zenith. It then sinks gradually toward the horizon at the rate of

fifteen degrees per hour, and will have disappeared completely before midnight. If the phenomenon is observed in the east before dawn, the same process occurs in reverse order.

At intermediate latitudes it is best seen when the ecliptic is more nearly perpendicular to the horizon. In the United States the zodiacal light may be observed in the evening in March and April, and in the morning in September and October. At all other times the zodiac is closer to the horizon and the light is dimmed, beyond the limits of visibility, by haze and dust. In the tropics and at the equator the ecliptic is almost perpendicular to the horizon throughout the year, and, consequently, the zodiacal light is visible most of the time.

Although the brightness fades gradually as the distance from the sun increases, there is an enhanced patch, about ten degrees wide, directly opposite to the sun. This patch is usually designated by its German name, *Gegenschein*, meaning counter-glow.

Spectroscopic observations have revealed that the zodiacal light is produced exclusively by reflected sunlight, comparable to the light reflected by the moon, the planets, and the asteroids.

The explanation of the phenomenon is a reasonable one, and its general principle is easy to understand. We must remember that there is no real discontinuity in the size of planetary objects in the solar system. The largest of the minor planets, Ceres, with a diameter of 480 miles, has about the size of the satellites of Uranus, whereas the majority of the known minor planets are only from ten to fifty miles across, and a few are only a mile or two in diameter. Any planet smaller than that would be too faint to be observable. This does not mean that they do not exist. It does not take much effort of the imagination to understand that there are, in the solar system, innumerable objects of extremely small size.

H. C. van de Hulst has shown that one may account for the total brightness of the zodiacal light if one assumes that the sun is surrounded by a cloud of tiny particles four one-hundredths of an inch in diameter, spaced five miles apart on the average, and reflecting the light in the same proportion as does the moon. This cloud extends throughout the solar system. It has the shape of a flattened disc with its principal plane coinciding roughly with the plane of the ecliptic. Its estimated thickness is one-tenth the diameter of the earth's orbit. In other words, all the particles that go to form this cloud would be found in the same regions of the solar system where all the planets and asteroids are found.

In spite of the large number of particles involved, they are so small that their combined mass is almost negligible. Needless to say, they are too small to be seen in-

dividually. It is their combined reflection and scattering of sunlight that we see in the guise of the zodiacal light. Their space density is of the order of one one-millionth of an ounce per cubic mile. That is to say that the combined mass of all the particles located inside the orbit of the earth would amount only to approximately one one-billionth of the mass of the earth.

When similar theories were advanced some twenty years ago, astronomers found them difficult to accept. It was believed at the time that, if such particles ever

existed in the solar system, they had been ejected from the sun at the time that the other planets were formed several billions of years ago. But it was also known that a body revolving around the sun, receiving heat from it and radiating this heat back into space, would gradually spiral in toward the sun, until it finally fell back into it. This is known as the Poynting-Robertson effect. The smaller the body, the faster does this spiraling-in take place. A rock two-fifths of an inch in diameter would be swept into the sun from the earth's distance in

twenty million years. This means that all the fine particles existing in the solar system at the time of its inception would have been swept back into the sun a long time ago.

Recently, however, Fred L. Whipple has shown conclusively that enough material is continuously being lost by comets to replenish the supply of small particles required by van de Hulst's theory. On the other hand, S. Piotrowski has suggested that an adequate amount could also be provided by the continuous grinding of asteroids. Undoubtedly, both sources contribute to maintain the proper amount of particles, although present evidence seems to indicate that the cometary source is the more important. Whichever the case may be, either hypothesis is sufficient to render valid van de Hulst's explanation of the origin of zodiacal light.

In the month of April the New Moon will occur on April 11 and the moon will be full on April 25.

Mercury will enter the evening sky on April 6. It will be found in Aries on April 15, setting in the evening twilight 45 minutes after the sun on that date. By the end of April it will set one hour and 45 minutes after the sun.

Venus, in Taurus, will reach its greatest eastern elongation on April 12, setting four hours after the sun on that date. On April 15, its magnitude will be -4.0, and it will be found to the north of Aldebaran.

Mars, in Capricornus, will rise in the southeast just before 2:00 A.M. on April 15. It will be seen low in the south at dawn.

Jupiter will be found west of Regulus in Leo. Already up by sunset, it will pass overhead around 8:00 P.M. and will set at about 3:00 A.M. (continued on page 219)

THE LION HAS A VISITOR

*The Lion has a visitor,
It is the planet Jupiter
That follows Regulus around.
Across the middle sky they go
When night is malachite on snow
On top of the cold ground.
Sometimes the moon like a shepherd leads
Or trails them through the starry meads,
Sometimes a cloud or tree branch stretches
Up and for a moment snatches
The bright pageant from your view —
The Lion and the planet, too.*

Elizabeth Jane Astley

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,
and Director of Nature Education, The American Nature Association

Science Crises

AT THE MEETING OF THE American Association for the Advancement of Science, held in Atlanta in December, 1955, one of the most interesting meetings centered around a consideration of crises in the field of Science Education. Rarely have I seen such mixed emotions as were expressed by those leaving this particular gathering. Representatives of government and of national organizations spoke dynamically of the situation that must be faced despite a diminishing supply of superior science teachers and an increasing demand for effective pre-college and college undergraduate science programs. We are not concerned here with what was said for it is being repeated, by word of mouth, from speakers' platforms and through the press across the country. What did concern me was the resentment shown by many at being told what was what and then having no opportunity to present another side. One well-known science educator stood sputtering by my side for fully ten minutes because he had not had an opportunity to make a speech to the large crowd that the "big names" had attracted.

I agree fully with the conclusion that science education faces a most important crisis. I have mentioned it repeatedly on this page. I must reiterate, however, my conviction that the real crisis lies not in the actual situation but how we are going to meet it, and whether we think we can buy a solution simply by raising salaries.

Placing the talent

At the airport, as I left Atlanta, I met a former student of mine. He was a better than average worker. I asked him how he was getting along and he told me, enthusiastically, of the new opportunity to teach that had just come to him. I congratulated him on what seemed to be a bright future, and then he turned to me and said: "But I don't like the way things are going. Now they will take any sort of teacher who says he is trained in science. I

REPRIEVE

*The choke cherry would have to go
Both gard'ner and I agreed —
In our landscaping pattern
It served no further need.*

*But this morning things look different
And we're pruning it instead —
For this morning in the sunlight
It held cardinals breaking bread.*

Emeline Ennis Kotula

miss the competition for recognition that I used to have to face." To tell you the truth I have not worried greatly about what he will do with his opportunity. I only wish he had half the chance held by the science educator who resented the fact that he could not make a speech before a large crowd. Somehow, to me, the great crisis in science teaching now lies in our ability to place properly the talent that is available to meet the many situations that exist.

When I got home I found a letter from a friend in New Mexico. He has a son taking high school science under a teacher who apparently has only recently been granted a Ph.D. in the educational field. The parent and teacher apparently are not agreed on the relative merit of knowing how to teach and of knowing something to teach. The fact that the students seem to be failing has not impressed the teacher so long as he is satisfied that he is using the methods he was taught to use. The teacher informed the parent that, since both were holders of Ph.D. degrees, one was as good as another. Just how moronic can a Ph.D. be? One of the present crises in Science Education seems to me to be centered around blind faith in the all-around value of the stamp of approval given by a degree. How could one assume that a successful engineer was necessarily likely to be equally successful in the fields of foreign language or Oriental poetry. Certainly one

cannot safely assume that a Ph.D. in Education automatically makes it possible for one to be a superior teacher in all fields of human endeavor. If we blindly accept any such philosophy we are doomed to failure in a world rapidly becoming highly competitive in all important fields.

Example of medicine

The same day I got this letter about a teacher who thought that a degree made him an authority in all fields, it was announced that a huge State tuberculosis hospital in my home town was being closed for lack of patients. To me this was a wonderful demonstration of the value of dedicated intelligence in solving an important social situation. Here was a disease that had repeatedly taken some of my friends during my lifetime. It had remained a threat for generations, even in the days when it was considered impolite even to admit that one had the disease. The science of medicine really went after tuberculosis, and, as a result, a huge hospital dedicated to its elimination is no longer needed. It was not staffed by any old sort of person but by those best trained in controlling that one disease. We have won that battle to all intents and purposes. Now we will do the same thing for other diseases, such as polio, cancer, diseases of the heart and so on. This will be done by using the highest degree of integrity in the selection of a staff, in the training of the staff, and in providing the facilities necessary for members of that staff to do the job for which they are hired.

In spite of all I have written and said over the years I like to think that some day, in Science Education, we will be able to look back on our accomplishments with pride similar to that to which the medical profession is entitled. I do not believe that that is possible at present. It will not be possible until we can meet our everyday crises with the utmost candor and not fall back on degrees, or tenure, or salaries, or anything else to bolster our status in society. We must have the best for our professional field, for our children, for our personal survival and for the sake of our consciences. As the Duke of Albany said in the closing phrases of Shakespeare's *King Lear*, we must forget politics and "speak what we feel, not what we ought to say."

♪ ♪ ♪

The Nylon Safari

By *Rebna Cloete*. Boston. 1956. Houghton Mifflin Company. 276 pages. \$3.50.

This book is sort of a dividend or by-product of the experience that produced *The African Giant* by Stuart Cloete. Along on the African safari was Rhena "Tiny" Cloete, who has a sense of humor. Travelling through Tanganyika with her husband and "The White Hunter," she had ample opportunity to watch these two in action, and otherwise. What she saw and recorded is presented here and it is lots of fun, and exciting, too.

Prosperity Beyond Tomorrow

By *Samuel H. Ordway, Jr.* New York. 1956. The Ronald Press Company. 208 pages. Foreword by Paul B. Sears. \$3.00.

Looking at our natural resources and then at tomorrow, there have been prophets of doom and assurers of plenty; the plaintiffs of the Malthusians and the Cornucopians. Mr. Ordway does not set out to prove the rightness or wrongness of either view. Instead, he says: "To face intelligently the problem of civilized survival requires first of all a comprehension of what, in fact, has been and is happening to man and to the earth and to the resources of the earth on which mankind depends." This, then, is the objective of this provocative book. Mr. Ordway writes clearly and persuasively. He makes excursions from the practical resource viewpoint into the areas of education, recreation, leisure and maintenance of peace. His is not a book that can successfully be reviewed briefly. It should be read.

Follow the Whale

By *Ivan T. Sanderson*. Boston. 1956. Little, Brown & Co. 423 pages. Illustrated. \$6.00.

Several years ago Ivan Sanderson wrote a remarkably comprehensive and interesting article on whales for *Nature Magazine*. It was concerned with the status at that time of the principal whale species. This is the story of man's following of the whale from the dim past to today. Indeed, man has been following these great marine mammals for some ten thousand years, not for two hundred years or so as some people appear to think. Whales are the reason for a geographically vast and complicated business, one filled with adventure and slaughter of a natural resource. The author tells his story splendidly and for everyone.

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GIVE



THE Nature CAMERA

By EDNA HOFFMAN EVANS

Picturing the Winner

I WENT TO THE races the other day, not so much to watch the horses as to see how photo-finish pictures are taken. It was an interesting application of photography, and I greatly enjoyed that part of my afternoon at the track. Not being a betting woman, I had nothing at stake and I could watch the field round the turn and thunder across the finish line without a single quiver of excitement born of financial interest. It seemed to me that the prettiest horses, or the ones with the cleverest names, always lost, anyway.

The scene was Turf Paradise, a new track recently opened at Phoenix, Arizona. The setting there is a beautiful one, with a range of mountains in the background, four ponds inside the oval of the track (no flamingoes yet, but give them time), grass, flowers, and shrubs in a desert setting. Beautiful, yes. But I prefer my Nature without pari-mutuel windows and unadorned by torn-up tickets, empty popcorn boxes, paper cups, and other race track debris.

As stated in the daily program, the finish of each race and the placing of each horse is confirmed by the photo-finish camera. Of course, not all races are so close as to need such a record in order to determine the winner. In a few, however, the leading horses are so nearly nose-to-nose that the eye cannot be entirely sure just which nose did cross the finish line first.

The photo-finish camera at this particular track is operated from a room high above the stands and just opposite the finish line. It is as high up, I would say, as a fifth-story window. The grandstands go up for a good three stories, above them is the judges' room, and above that is the room from which the pictures are taken.

One-purpose camera

The camera is a custom-made affair, designed for one purpose only. It does not look much like a camera for it is simply a rectangular ply-

wood box from which protrudes about twelve inches of lens tube. The lens is focused across the finish line on a "spinner" device that will be described later.

The shutter is electronically controlled so that the picture is made as the nose of each horse touches the finish line. In this case the camera does not "freeze" motion; instead,

leg is caught in such a position that it is moving in the same direction as the film, a distortion or elongation results. Such an effect is called a "rubber leg." It looks like rubber, too—stretched.

The camera lens is so focused that it sees only a three-inch-wide strip of the track. Inside the camera, the film moves past a slit not more than 10/1000-inch wide. Thus, what the camera records is not the scene that the eye sees at the instant that the leading horse crosses the line; instead, it is a succession of horses passing a three-inch section of the track. No horse is pictured until its nose does touch the finish line. Since only moving objects are re-



This picture of a photo-finish shows the position of the "place," or second, horse in the race. Note the slightly distorted, or "rubber leg" effect, on the horse's right foreleg. In the background note the vertical lines on the "spinner," together with the track name, the date and the number of the race. Horse #4 was the winner; #7 was second; #6 was third. The line across the nose of #7 was put there in the printing of the picture. Every object in this picture was in motion except the ground, and note how the lines in the track are horizontal blurs.

it records only things in motion. The camera is stationary, but inside it the film moves in the opposite direction from that in which the horses are running. In other words, the effect is the same as a "pan," except it is the film and not the camera that moves.

As a result of this movement the negative is about eighteen inches long and about two inches wide. The film is extremely fast; it is made by the Eastman Company especially for photo-finish records. Surprisingly enough, there is not a great deal of distortion to the resulting images. Occasionally, though, when a horse's

corded, stationary objects appear as meaningless blurs — exactly the opposite of what occurs in a regular "still" picture.

Two cameras used

Because of the width of the track, two cameras are used for complete coverage, in the event that the "field" is widely scattered as it crosses the finish line. One camera catches the horses close to the opposite rail and the other catches those running along the nearer rail. This double shooting is not always necessary, but two pictures may be taken, just in case. After all, with thousands and some-

times hundreds of thousands of dollars "riding on a horse's nose" it is vital to show just where that nose was at the all-important finish. At least it is vital to everyone who has money at stake.

Time is of great importance in getting the official results to the judges. To do this, the operator changes from cameraman to darkroom attendant in less than the twinkling of an eye. As soon as the exposure is made, the window through which the cameras were focused is closed (it has a wooden shutter), and the entire room becomes a darkroom. Out from the camera comes the film, and into the developer it goes. The developer, incidentally, is kept at a temperature of 110 degrees to insure rapid action. And rapid it is, too. That negative is developed and ready to be viewed by the judges within *forty seconds* after the last horse goes by!

To save time at Turf Paradise, the wet negative is put into a projector and the image thereon projected through a hole in the floor of the camera room to a screen in a curtained alcove in the judges' room below. Except in the rare case of a "dead heat" the judges can take one look and make the results official.

Quick printing

The operator's next job is to make an 8 x 10 print for each of the three leading horses, indicating the "win," the "place," and the "show" positions. The line across the picture, showing the position of the nose in each case, is not in the original negative, but is added by the operator when he prints the picture. The "win" print is posted down near the pari-mutuel windows. That process is slower, of course. The print may not go down for ten minutes after the race is over. I have used the term "slower" in a relative manner. To the amateur photographer, who must wait anywhere from twenty-four hours to a week before getting the results of a roll of film from a commercial finisher, the process will seem exceedingly fast.

The cameras used for photo-finish pictures are not covered by patents. A test case revealed nothing particularly new about them, just special applications of well-known photographic principles. The patented article in this instance is the "spinner," which I mentioned before. It is the "gimmick" that makes the difference.

The spinner is located inside a box facing the camera on the far side of the finish line. On the spinner are painted vertical black lines; also in the case of Turf Paradise, the name of the track is painted thereon, and there are slots into which can be inserted the date and the number of each race.

The spinner is a cylinder and it spins inside the box, with its vertical lines moving past a three-inch slot in the box. The spinner spins in the same direction that the horses are traveling. Thus, the negative and the final picture show the vertical stripes, together with the successive letters of the track's name. Each repetition of the name means that one complete spin has been made. The spinner is set in motion from the camera booth, and it begins spinning as the horses approach the finish line. Momentum keeps it going for some time after the race is over, and it moves so fast that the eye can detect nothing but a grayish blur as the lines pass by the opening in the box.

And so I learned about the photo-finish. With all that photographic information to digest, I really did enjoy my day at the races. I had no winnings to add (except knowledge) and no losses to regret. But I did come away from the track with an even greater respect and appreciation (if such could be possible) for the potentialities and performances of photography.

Also specialized

Another specialized application of photography techniques is described in a recent release by the Du Pont Product Information Service. I have cut it slightly:

"The scene is a New York City hospital where doctors are trying to locate an abnormal artery-to-vein 'leak' in the hand of an 11-year-old boy. For a series of X-rays, an opaque solution is injected into the boy's arm. This will show on the X-ray plates and enable the doctors to locate the trouble.

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the company arrives with several gallons of the special intensifier recently developed by Du Pont for intensifying radiographs to improve their diagnostic value. Into this solution go the weak X-ray films. The process builds up density of the weak silver image by changing its chemical composition. The radiologist examines the intensified films, locates the arterio-venous by-pass in the boy's hand and recommends surgery to close it. The boy's hand is saved and his recovery is assured. Thus has photographic know-how played another important role in the activities of mankind."

Speaking further of X-rays, the Ansco Company reports that it has been awarded a new government contract for medical X-ray film by the Armed Services Medical Procurement Agency. Under this contract, Ansco is to deliver more than \$150,000 worth of film during the next six months. That is a great deal of film!



This is one of two new models of the Kodak Duaflex camera. This model, with the prefocused Kodet lens, sells for \$15.95.

And finally, two new models of the Kodak Duaflex camera have been announced by Eastman. Both models feature the $2\frac{1}{4} \times 2\frac{1}{4}$ inch "pre-view" picture finder, both have a new brown finish, new focusing scale designations, and a new shutter synchronized for use with all popular types of flash lamps when set for instantaneous exposures. The Kodak Duaflex IV camera with Kodar lens (focusing from $3\frac{1}{2}$ feet to infinity) is priced at \$24.50. With the Kodet (prefocused) lens the model sells for \$15.95. A brown Kodalite flash-holder priced at \$4.25 is available for either camera.

Bulletins

"Imagine My Surprise" by Barbara M. Benedict is a collection of Nature cartoons along the lines of "Believe It or Not" published by *The Lynden Tribune*, Lynden, Washington, in which the cartoons originally appeared. Fifty cents.

"Naturalist Guide to the Gem Lake Trail, Rocky Mountain National Park" by Richard G. Beidleman is a recent publication of the Rocky Mountain Nature Association, Estes Park, Colorado. 50c.

"Fish Conservation Highlights of 1955" is the title of the 72-page Bulletin of the Sport Fishing Institute, Washington 5, D.C. for January, 1956. It is a State-by-State summary of accomplishment.

"Report of the Nature Conservancy" 19 Belgrave Square, London, S.W.1, covers the year ending September 30, 1955. Seventy-five cents.

"Geology of a Portion of the Elsinore Fault Zone, California" is a 22-page (with map) report published as Special Report 43 of the Division of Mines, California Department of Natural Resources, Ferry Building, San Francisco 11, for 75 cents. "Bibliography of Marine Geology and Oceanography, California Coast, appears from the same source as Special Report 44, also 75 cents.

"The California Five-Spined Engraver and Its Biology and Control" by George R. Struble and Ralph C. Hall is Circular #964, U.S. Department of Agriculture and for sale by the U.S. Government Printing Office, Washington 25, D.C., for 15 cents.

"A Study of the Insects Living on the Wayfaring Tree" by K. C. Side is a 20-page pamphlet published by the Amateur Entomologists' Society, 1 West Ham Lane, London, E.15, England, for 35 cents.

Recent publications of the Smithsonian Institution, being Publications #4195 to 4200, inclusive are entitled, in order, "On Comparing the Brain with Machines" by D. M. MacKay; "A Glimpse of Incomprehensibles" by George W. Corner; "The Electron Microscope in Biology" by Ralph W. G. Wyckoff; "The Spread of the Cattle Egret" by Alexander Sprunt, Jr.; "The Migration of Mammals" by L. Harrison Matthews; "The Flight of Animals" by James Gray.

"Legume Insects of Oregon" by E. A. Dickason and R. W. Every is Extension Bulletin 749 of Oregon State College, Corvallis, Oregon.

"The Trees that Are Marked for Marker" is another cartoon-style educational publication of the International Paper Company, Southern Kraft Division, Mobile, Alabama, describing modern forestry policies of selective logging. There is an accompany teacher's guide with suggestions for use. Free.

"Distribution and Food Habits of the Fur Seals of the North Pacific Ocean" by F. H. C. Taylor, M. Fujinaga and Ford Wilke is an 86-page report of joint investigations by Canada, Japan and the United States. Superintendent of Documents, Washington 25, D.C., 50 cents.

"Conservation Education for American Youth" is a 35-page pamphlet reporting on a work conference. University Press, Ohio State University, Columbus 10, Ohio, 50 cents.

"Ortho Garden Book" contains in 36 pages much garden advice, from the control of insects to the storage of garden tools. California Spray-Chemical Corporation, Richmond, California.

"Limnological Effects of Fertilizing Bare Lake, Alaska" by Philip R. Nelson and W. T. Edmondson is Fishery Bulletin 102. Superintendent of Documents, Washington 25, D.C., 20 cents.

"The University of California Botanical Garden Expeditions to the Andes (1935-1952)" by T. H. Goodspeed and H. E. Stork is a 134-page report and includes observations on the phytogeography of Peru. University of California Press, Berkeley 4, California, \$1.25.

"Optics for Profit, Fun or Study" is the latest catalog of Edmund Scientific Corporation, Barrington, N.J.

"Eton College Natural History Society" publishes its eleventh report covering the years 1950 through 1955. From the Society at Windsor, England, for 50 cents.

"Resources for the Future, Inc., Annual Report" covers the activities of this Ford Foundation-endowed organization for the year ending September 30, 1955. Address 1145 19th Street, N.W., Washington 6, D.C.

Moon Snail

(Continued from page 183)

of the Pacific northwest used them as food. The shells of the moon snail are abundant in Indian kitchen middens.

On the theory that we might be missing something in life, we decided to try eating a few moon snails ourselves. We had to cook them anyway to extract the occupant, if we were to keep the shell. Boiled—a little too much, I am afraid—there was a good-sized piece of meat in the large foot. It made one realize how much the tissues are compressed when a snail dehydrates to get into this shell. There is a definite knack for preparing mollusks so that they are tender for the table. In all fairness to the moon snails of our experiment, we apparently did not have the knack. And so, although the meat, very thinly sliced to be chewable, did have a pleasant salty-sweet flavor, there was no mistaking that we were trying to penetrate the sole of a snail's foot.

There is enough about the moon snail to make it an exciting first find without considering it as a menu item. Among the slowest of predators, this snail will continue its inexorable time-locked hunt, disregarding completely the increasing acceleration in the life of its greatest competitor, man. Even at its pace, it has come a long way from its vegetation-rasping ancestors. 🐌🐌🐌

Treasure

(Continued from page 209)

as hardcover Nature books, mineral and sea-shell sets, and wood-carving sets, are reserved for the first, second and third place winners, and are chosen by the children themselves in the order in which they finished. Solely to the first place winner goes the honor of having his or her name inscribed upon the permanent trophy, which remains at the Center. The twenty-two runners-up are allowed to choose their prizes in order from a variety that usually includes different Nature books and knick-knacks.

So the next time your young Nature group starts to bog down a bit on a cloudy afternoon, try calling out, "How would you like to go on a treasure hunt next week-end?" Then watch the sun break through. 🐌🐌🐌

Lubber

(Continued from page 187)

vast quantities of man's food. But it seems to me that they are not entirely without benefit. As they eat leaves of one season, their droppings at the foot of the plant may feed the soil for the coming season, renurture it with the food from the very plant that grew there. In short, there is the possibility that grasshoppers are little fertilizer factories, playing a role in the scheme of Nature. This, of course, is hypothetical. As they stand today, locust plagues constitute a most grave menace. But Sally, of course, was not a migrating locust. She was different. Nothing Sally did was wrong, in my opinion. She was an ugly little thing, but she was still a wonderful pet! 🐛🐛🐛

Deserts

(Continued from page 204)

millions of dollars of public funds for controlling spruce budworm can be justified. Spruce budworm is a native forest insect. It has been with us about as long as our forests. We still have our forests and they still are fairly productive. The stands sprayed at costs up to \$1.40 per acre have, no doubt, withstood several infestations as heavy as the one the Forest Service is now attempting to control.

When conditions are favorable, insect populations tend to build up to epidemic proportions. This, of course, makes things favorable for their parasites and predators, and these also increase in numbers. The combination of reduced food supply (a direct result of over-population) and an increase in their enemies soon wipes out the epidemic and reduces the insect pest to normal numbers.

The promiscuous use of DDT kills friend and foe alike. The budworms surviving the spraying (7 percent of an abnormally high population) are free to multiply unhindered by their normal enemies. This year or next the Forest Service will find it necessary to request even larger appropriations to combat spruce budworm. Heavier dosages will be needed. A larger percent of the population will prove resistant and survive to re-infest the forest. It will become a perpetual problem.

In the region with which I am familiar there is evidence that the spruce budworm infestation had

about run its course and the infestation would be controlled by natural biological forces. Unsprayed spruce and fir stands on private lands seemed to suffer little damage this year from spruce budworm.

It would seem obvious that no agency can dump more than a thousand tons of DDT, and millions of gallons of fuel oil, from planes without creating havoc with the balance of Nature. 🌱🌱🌱

Zodiacal

(Continued from page 213)

Saturn, in Scorpius, will rise at about 9:00 P.M. on April 15 and will be visible for the rest of the night. It will be found approximately eight degrees north of Antares.

The Lyrid meteor shower on April 21 will not be favorable this year because of the brightness of the moon. 🌟🌟🌟

Nature's Wonders

Edited and compiled by Charles L. Sherman. New York. 1956. Hanover House. 252 pages, with illustrations in full color. Introduction by Robert S. Lemmon. \$7.50.

Fourteen Nature adventures with popular and informational text and with some 460 full color illustrations. This is a popular introduction to Nature that draws upon the National Audubon Society—Nelson Doubleday Audubon Nature Program. The chapters deal with animal children, seeds and seed pods, eyes in Nature, song birds, life in a woodland pond, wild flowers, butterflies and moths, Everglades life, camouflage in Nature, Nature's architects, flowering trees and shrubs, inventions in Nature, life in shallow sea water, and birds of prey.

Science

By Bertha Morris Parker. New York. 1956. Simon and Schuster. 97 pages. Illustrated in full color by Harry McNaught. \$3.95.

This is a colorful and elementary introduction to natural science, and the full title is *The Golden Book of Science for Boys and Girls*, it being one of this publisher's "Giant Golden Books." The author was formerly of the Laboratory Schools of the University of Chicago. The text is for the grade school youngster and provides an early and general exposure to science as a basis for later courses.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Biology on Parnassus

WE HAVE often been intrigued by finding instances in literature—the more classical the better—of the use of biological principles. These are, of course, not labeled as such, and may be quite inadvertent, the author having no intention of illustrating principles. These occurrences are not to be confused with works having a titular biological subject: *To A Skylark* or *The Chambered Nautilus* are justly famous poems and the latter is especially good scientifically. Examples of this character are descriptive and usually moralizing, and volumes could be brought together of literary productions that have stood the test of time and approval and that deal with organisms other than man, or with various aspects of man as an organism.

What we have in mind, however, are allusions, open or concealed, of such basic principles as division of labor, evolution, or homology, and a fertile field in which to dig is the *Rubaiyat* of Omar Khayyam, a universal favorite that constitutes one of the literary wonders of the world, both in its original Persian and in its best-known English translation. A short introduction to place the time and setting will make the remarkable philosophy of the *rubais* (quatrains) the more readily appreciated.

The man known to western civilization as Omar Khayyam bore the Saracenic designation of Ghiyathuddin Abulfath 'Omar ibn Ibrahim al-Khayyami. Khayyam means tent-maker, as those whose memory in the American theatre goes back to Otis Skinner will recall, and was taken by Omar either for his father's trade or for that of his own youth. He was born at Nishapur, on an undiscovered date, and is also buried there, the accepted although still questioned date of his death being A. D. 1123. He was famous in his day as a mathematician and astronomer and wrote a celebrated treatise on algebra. Being summoned by the Sultan Malik-Shah to participate in a large-scale calendar

reform, he responded and accomplished a revision said to be better than those adopted by western countries, such as the Gregorian.

*Ab, but my Computations, People say,
Reduced the Year to better reckoning?—*

*Nay,
'Twas only striking from the Calendar
Unborn To-morrow and dead Yesterday.*

Omar also reformed astronomical tables. In the west, however, his great scientific fame has been completely eclipsed by his rank as a poet, based chiefly on his *rubais*, of which there were some five hundred. These show a startlingly modern and free-thinking attitude toward life and toward the philosophical questions of both his day and ours, almost a millenium later, and they have won for him a tremendous following the world over. While the ideas are Omar's, the language in which they are couched, and hence their great beauty as poetry is owing to one of the most remarkable of all translations—the extremely difficult change from Persian to English that became the major work of Edward Fitzgerald, the first edition appearing in London in 1859. There have been revisions by this author and many other studies in English and in other languages. Indeed, the bibliography of and about the great Persian is a lengthy affair. Let us see what some of his Twelfth Century notions were, at a time when the western world was still suffocating under the blight of the Dark Ages.

Variation LXXXIII

*Shapes of all Sorts and Sizes, great and
small,
That stood along the floor and by the
wall;
And some loquacious vessels were; and
some
Listen'd perhaps, but never talk'd at all.*

Teratology LXXXVI

*After a momentary silence spake
Some Vessel of a more ungainly make:
"They sneer at me for leaning all awry:
What! did the Hand then of the Potter
shake!"*

Catastrophism LXXXVIII

*"Why," said another, "Some there are
who tell
Of one who threatens he will toss to Hell
The luckless Pots he marr'd in making—
Pish!
He's a Good Fellow, and 't will all be
well."*

Preformation, Encasement LXXIII

*With Earth's first Clay They did the
Last Man knead,
And there of the Last Harvest sow'd the
Seed:
And the first Morning of Creation wrote
What the Last Dawn of Reckoning shall
read.*

Epigenesis LXXVIII

*What! out of senseless Nothing to provoke
A conscious Something to resent the yoke
Of unpermitted Pleasure, under pain
Of Everlasting Penalties, if broke!*

Nitrogen Cycle XIX

*I sometimes think that never blows so red
The Rose as where some buried Caesar
bled;
That every Hyacinth the Garden wears
Dropt in her Lap from some once lovely
Head.*

XX

*And this reviving Herb whose tender
Green
Fledges the River-lip on which we lean—
Ah, lean upon it lightly! for who knows
From what once lovely Lip it springs
unseen!*

Immortality of the Germ Plasm V

*Iram indeed is gone with all his Rose,
And Jamshyd's Sev'n-ring'd Cup where
no one knows;
But still a Ruby kindles in the Vine,
And many a Garden by the Water blows.*

XLVI

*And fear not lest Existence closing your
Account, and mine, should know the like
no more;
The Eternal Saki from that Bowl has
pour'd
Millions of Bubbles like us, and will
pour*

XLVII

*When You and I behind the Veil are past,
Oh, but the long, long while the World
shall last,
Which of our Coming and Departure
beeds
As the Sea's self should heed a pebble-
cast.*

But Omar does not sit alone on Parnassus and we shall see what some of the other residents of this fabulous

mountain have to say about biological principles from time to time in later installments.

Biological Laboratory Manuals, XI

General Biology

Laboratory Studies in Biology, Observations and their Implications, by C. A. Lawson, R. W. Lewis, M. A. Burmester, and G. Hardin. Illustrations by Evan L. Gillespie. Pp. vii, 328; figs. 129. W. H. Freeman & Co., San Francisco, 1955. \$3.50.

This is a workbook that departs widely from the usual form of laboratory manual. Descriptive biology is not slighted, but is held to a minimum considered essential as a basis for the asking of questions. These are designed to make the student think about the material and to draw conclusions from his observations. Experimental work is frequent, sometimes demonstrational, at other times individual. The student is asked to make discoveries, and to formulate statements about these discoveries, whether right or wrong. Frequently the answer to a question is supplied in the next sentence, or is so obvious it could not be missed, but by putting the material in the form of a question rather than as a factual statement, the student is led to feel that he is participating and that many of the replies are his own ideas.

The book we reviewed is the *Teacher's Edition*, with lists of materials and equipment. Sometimes these lists appear formidable, but if analyzed will be found to consist of the items commonly stocked in most departments. The work covers forty exercises for a year course in general biology at the college level, and has thorough coverage, including cells, organ systems and their physiology, heredity, development, paleontology, the taxonomic series of both plants and animals, ending with man, museum or field study, cycles and food chains, populations and evolution. We recommend this book and believe it will prove to be a most stimulating and interesting experience to use it in teaching.

Anatomy and Physiology

A new workbook for use in the training of nurses is the *Laboratory Exercises in Anatomy and Physiology* by Dorothy Walton Parry, Science Instructor of the School of Nursing,

Henry Heywood Memorial Hospital, at Gardner, Mass. This is an exceptionally well organized and written book that should prove effective in nursing and related programs. There are 22 laboratory periods arranged as 8 Units:—support and movement of the body (gross features, cells and tissues, skeleton, joints, muscles), ways and means of learning (nervous system and sense organs), transportation of materials in solution (blood and circulatory system), exchange of gases (respiratory system), changing food to fuel (digestive system), ridding the body of wastes (excretory system), important internal regulatory processes (skin and endocrines), and carrying on the species (reproduction and development).

Each exercise consists in demonstrations from models, charts, books, slides, and specimens, with individual experiments and tests. The student also labels prepared drawings, fills in tables, and submits reports. The drawings are well done and topics are clearly defined. Each exercise concludes with a list of self-test questions, and there is a liberal sprinkling throughout of blank sheets for notes and sketches. There are also optional and supplementary units. Those concerned with either teaching or studying this subject will enjoy looking over a copy of this excellent manual. Pp. xi, 158; figs. 53. G. P. Putnam's Sons, 2 West 45th St., New York 16, 1955. \$3.00.

Protozoa

How to Know the Protozoa, by T. L. Jahn and F. F. Jahn, University of California at Los Angeles.

This is far and away the best manual with which to identify the protozoa. First, there is adequate treatment defining a protozoan, telling where to find and how to collect them and what to do with them afterward; then a discussion as to sizes, modes of life, reproduction, and locomotion, followed by instructions on classification and how to use the pictured key. Then comes the key proper, and lastly the index and pictured glossary.

A very large number of genera and species are figured and described, including the parasitic forms. Having first seen, then used this book, it seems incredible to us that such a production was not attempted before; we cannot now imagine anyone who



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wishes to study protozoans managing to get along without this aid. With this and the companion volume on algae, the microscopist is equipped to tackle the identification and study of all the unicellular forms of life he may collect from our freshwater ponds and streams and many other situations. Pp. vi, 234; figs. 394. Wm. C. Brown Co., 915 Main St., Dubuque, Iowa, 1949. Spiral wire binding, \$2.25; cloth, \$3.00.

New Leitz Micro-Manipulator Introduced

A NEW micro-manipulator with single one-hand mechanical control so precise that micro-knives, needles and pipettes can be kept within even a 0.136 mm field of view during operations on living cells and other specimens has been developed for use in the biological sciences and technology. Completely new in its principle and engineering, it is the first such development in micrurgy by Ernst Leitz, Wetzlar, West Germany, since the war.

It has been a scientific problem to keep the small tools in the field of view because once they pass from it, the distance cannot readily be gauged to resume the operation, it was explained. Sturdy and large as required in the laboratory, the new micro-manipulator assures precise horizontal motion of the small instruments. Achievement of mechanical control also is said to eliminate the effects of climatic conditions common in pneumatically controlled instruments.

In the field of biology and medicine, applications include: the production of single cultures; artificial insemination; the isolation and transplanting of single sperms or bacteria; and the injection of media, important in studying infections.

In technology, the micro-manipulator is useful in the examination of constituents of materials, the elasticity of fibers, viscosity, and the manufacture of extremely fine scales and other devices.

Some of the latest experiments employing micro-manipulators are concerned with the transplanting of one part of a cell to another. A nucleus has been successfully removed from a cell. Scientists also hope to test the role of genes in the cytoplasm; some work has already been done and evaluations are being made.

An example of current work in

micrurgy is that of Professor M. J. Kopac of New York University, who has reported a new procedure of transferring cell parts from one cell to another and studying their cytochemical properties. The process is facilitated by first transferring the cell from an aqueous to a non-aqueous, fluorocarbon, fluid. His paper is entitled, "Recent Developments in Cellular Micrurgy". (*Transactions of The New York Academy of Sciences* II, 17:257, 1955).

Literature on Leitz' new micro-manipulator is available on request from E. Leitz, Inc., 468 Fourth Ave., New York City.

New A O Accessories

WE HAVE recently examined two new appliances from American Optical designed for use with widefield stereoscopic microscopes. One is the A O No. 507 Polarizing Attachment which now makes possible polarized light microscopy with a binocular-binobjective instrument. It consists of a metal stage that is substituted for the glass stage of the microscope. Into this is built the polarizer film, and upon it is mounted a metal circular revolving stage, the periphery of which is graduated in five-degree intervals. Attached to a left corner post is a swing-out arm bearing a ring with the analyzer film; it may readily be swung aside for ordinary work, or put into the optical axis for polarizing. A clip on the stage holds discs for examining materials, or may be unscrewed and removed. Centration is easily accomplished by means of two thumb screws.

We tried this attachment on a number of materials that are commonly employed in demonstrating polarization of light and doubly-refractive substances. Dry-ground tooth or bone, hair or horn, feathers, sections of organs containing some keratin, and the like and found that it did the work admirably. However, the real value of this new item is in sedimentation studies and gross quantitative determinations. Price, \$63.00.

The other new attachment fits under the stage of the binocular microscope and alters it for darkfield studies. It is a condenser supplied with a darkfield stop and a mirror arm longer than usual, to get the mirror down out of the way. This is useful to the biologist in demonstrating such protozoa as amoeba

and paramecium, in large numbers, under relatively low magnification, providing views of locomotion and other activities not commonly available to students; slides of fresh blood, bacteria, diatoms, and other particulate items show to excellent advantage. Price, \$45.00. For further information on either of these appliances, write The American Optical Company, Instrument Division, Buffalo 15, N. Y.

New Edmund Catalog

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Glass Rain

AN AFTERMATH of our notice of Crystal Coverglasses in the December issue, 1955, gave us a new one for the book. Mr. J. Schultz, president of the Schultz Surgical Instrument Company at 59 Pearl Street in New York City wrote to tell us of taking some of these glasses out of a storage of twenty years, finding them as crystal clear as when made.

The occasion was an unprecedented order for 400 oz., 12 mm circles, No. One! Ordinarily an average of about one ounce per year will take care of orders for this unusually small size. Delivered to a New York firm, these covers were shipped to Hollywood for use in the movies. It was discovered that when dropped from a height and strongly floodlighted, the effect of rain is achieved! This is a most peculiar rain, however, as you can gather it up and use it all over again.

"I was pickin' pansies in Belleau Wood"



THEY WERE only a handful of dirty, haggard Marines. Paralyzed, they hugged the earth outside Lucy le Bocage as murderous German fire poured at them. And then they heard their little, middle-aged sergeant:

*"Come on, you ---- !
Do you want to live forever?"*

That yell, and the charge that followed, made Sergeant Dan Daly famous. But he wanted no glory. He already had *two* Medals of Honor, one earned in Peking, the other in the jungles of Haiti.

And when reporters asked about his World War I decorations, he said: "I was out in Belleau Wood pickin' pansies for my girl one day. And the officers said: 'Let's give the poor guy a medal.' Well, sir, they give me the DSC . . ."

No hero to himself, Dan Daly was a fearless and expert professional soldier—one of a breed some folks don't expect of a wealthy, peaceful land like America. Yet America's ability to produce men like Daly is a more important clue to her strength than all the gold at Fort Knox.

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